AMERICAN
DYESTUFF REPORTER

VOLUME XXIII JULY 2, 1934 NUMBER 14

Textile Printing Faults and Their Correction

By T. C. HUTCHINS

THE faults now to be enlarged upon are of a general nature and have occurred from time to time in the writer's experience. The object of the present notes is to explain in as clear a manner as possible the cause of each fault, while at the same time an attempt will be made to offer suggestions for their prevention and correction where this is possible.

Marking-Off on Chrome Mordant Blotch Print

The trouble of marking-off is not now of such prominence as it was formerly, when Madder or Alizarine colors were the principal means of coloring for fast textile prints. Nowadays there are only a few colors that show any tendency in this direction and these too are principally of the Alizarine type. Certain of the Alizarine reds, particularly the very bluish shades, have a very decided tendency towards this fault, and if used in very concentrated mixings for dark shades, precautions have to be taken to ensure that the unprinted portions of the fabric do not receive an impression of the pattern by contact during steaming.

In order to make the matter quite clear it might perhaps be as well to offer some explanation as to how a "mark-off" occurs. This fault arises principally, it would appear, from the great affinity of certain types of coloring matter for the material on which it is printed. Among colors of this class the Alizarines are probably the worst offenders, more especially when fixed with acetate of chrome. Marking-off will not occur of course where goods are steamed in a continuous steamer. In many works, however, the cottage steamer still holds pride of place and for small works this method is undoubtedly more advantageous.

The goods are in the first instance wound on to collapsible reels, from whence they are taken in loops and hung on poles. The poles with their burden of cloth are then hung upon carriages which are pushed into the body of the cottage steamer (really shaped like a large boiler) wherein they are hermetically sealed and the steam turned on for an hour at 7½ lb. pressure. The mark-off occurs principally as the result of the close contact of one fold of cloth upon another. The printed portion at one part of the piece is unavoidably in contact with an unprinted portion of another part, so that in the case of a color with a decided tendency to mark-off, an impression is left of the printed pattern on a part of the goods that was intended to be left unprinted. Where this occurs throughout a large run of prints and the mark-off is multiplied again and again the result can best be left to the imagination.

In the instance now to be described the fault took place in a somewhat different manner, though the principle is the same in both cases. The mark-off in the present case did not take place on a white ground but on a colored blotch which moreover was a dark bluish green, a shade one would have thought dark enough to conceal a fault of this description. The pattern in question was of a floral type, featuring large roses spread over a colored ground, the ground in this case being dark green and the roses red and pink. The colors themselves were of the chrome mordant type, except the pink in the roses which was a blue shade of Alizarine fixed with sulfocyanide of alumina. The ground color being dark required of course fairly large amounts of acetate of chrome for its fixation and it was this that gave rise to the mark-off.

The explanation is as follows: The goods were of a type (cotton voiles) that precluded ageing in the ordinary way, so that they had to be prepared for steaming without this preliminary process, which in such cases assists the deposition of the chromium oxide. If this preliminary fixation had taken place it is quite probable that the fault would not have occurred, or at least have been very considerably modified. The result was that, as the Alizarine pink shade came into very close contact with the heavily mordanted blotch, in the manner previously described, a certain amount of the Alizarine color

was attracted and fixed upon the green ground, thus showing at the places involved a mark-off of the pink portion of the pattern, which showed as an even darker shade of green superimposed upon the original ground.

The great difficulty about such a fault is that it is not removable by any means. This being the case it is all the more reason why such faults should be avoided in the first instance, by using colors that are known to be free from any tendency to marking-off.

The fact that it was the excessive quantity of chrome mordant in the dark green of the ground that caused the mark-off was easily proven by reference to another combination of colors in the same pattern. The same pink was again used on a light ground of chrome mordant buff, but without any repetition of the mark-off presumably in consequence of the fact that the quantity of acetate of chrome in use in this case was very much smaller.

The Choice of a Proper Color for Printing Certain Types of Blotch Patterns

As an instance of the high degree of specialization necessary for the efficient carrying-out of the duties of a colorist the following case may prove instructive.

The blotch pattern in the present instance was of the all-over type with a good deal of black dispersed through a light buff ground in chrome mordant colors. The choice of a color for the ground therefore depended upon several very important considerations.

I. Fastness to chemicking as compared with the black.
II. Levelness of fixation.
III. Washing-off properties.

It will be readily understood by all practical men that it is sometimes difficult to keep a light blotch color absolutely clean and free from contamination by another dirtier color. The difficulties are often those of mechanical limitations, although the printer may have done everything in his power to prevent any damage. Where it is therefore definitely known that such soiling is likely to take place the choice of a suitable color on the lines indicated will simplify the problem greatly and prove much more economical from a color point of view.

In the first place, fastness to chemicking is necessary so that the ground shade may be treated with bleaching powder solution when washed-off, for the removal of any contamination. If the ground shade should prove to be more fugitive to chemick than the contaminating color then the case is hopeless from the start, fastness therefore from this point of view is of primary importance.

Levelness of fixation is next in importance, for the very good reason that a blotch color that will not fix evenly to begin with will be in a very much worse condition by the time it has been chemicked once or twice as aforementioned. For the same reason, good washing-off properties are also desirable. By washing-off properties is meant the easy removal of all surplus color and thickening, the retention of which makes clearing or chemicking a much more difficult and unsatisfactory operation. Apart altogether from clearing, a color that does not fix easily as well is very prone to stripiness when washed-off, more especially when the goods are subjected to rope-soaping, an operation which is sometimes necessary in order to obtain a soft handle of the goods when finished. In this matter also great care must be exercised in the choice of suitable thickeners. For chrome colors of a certain type it is necessary to avoid the use of dextrin as far as possible, by reason of the reducing action of the latter.

The best and surest method of getting bright full colors is by the use of various starches and flours and modifications of these in the form of soluble thickeners. The choice of a thickener must of course be limited by the type of pattern, weight of engraving, etc., but by suitable mixtures of the many available kinds there is seldom much difficulty in finding one to suit any particular class of print.

Where trouble of the foregoing type is likely to be encountered there are only three ways of getting over it. The first is to use all the mechanical devices possible where the machine, etc. will allow of them, e.g. the insertion of starch rollers between the contaminated and contaminating colors, the washing-off of the roller bearing the light color by an apparatus specially devised for this purpose, so that the surface of the roller is kept under a continual flow of water, and the use of brush furnishers and brass lints.

Where these precautions are not possible by reason of mechanical or other limitations, the next remedy is to use as much color on the blotch print as will ensure its being kept comparatively clean. This of course means a tremendous amount of waste, involving in a bad case the use of twice as much printing color as would prove necessary in favorable circumstances.

The next remedy is that which has already been outlined in detail and as the writer has proven its worth on many occasions, he can recommend it to interested parties provided that they take the pains to observe the precautions that have been mentioned.

"Tailing" of Vat Colors Through Azoics Printed Alongside

In the present day demand for fastness many colorists have recourse to the combination of colors mentioned in the above heading. Both types have exceptional fastness properties but as they are fixed by reactions which are antithetical, some care must be exercised in their application. For instance if a vat color is allowed to come into contact at any point with an Azoic, destruction of both colors will result with the effect that only a whitish blur where one or other, or both colors ought to have appeared.

Vat colors are fixed by reduction to their soluble leuco-compounds from the insoluble state. Azoics are fixed

by oxidation to their insoluble diazonium compounds from the soluble state. Both these processes take place simultaneously under the influence of steam in the Rapid Ager and are brought to completion by washing-off processes which involve in the case of the vat color a further oxidation treatment in acidified solutions of bi-chromate of soda or potash, while the fixation of the Azoic compounds is completed by a treatment in a Glauber's salt-acetic acid bath, both types being then soaped preferably at or near the boil.

To come back however, to printing proper, the precautions necessary in such instances involve the use of the mechanical means detailed in a previous description for keeping a blotch ground unsoiled. Where this is not possible, as for instance when printing a three-color pattern on a three-color machine, "tailing" will take place, in spite perhaps of lints and brush furnishers. The difficulty in such a case is that it takes very little to do the damage, the slightest trace of a strong vat color having a semi-discharge effect upon the Azoic.

Another cause of damage in this connection and one which needs to be guarded against very carefully is the use of brush furnishers for Azoics that have been in previous use for vat colors. This may sometimes be noticed in the case of a light or medium shade of an Azoic. The color, supposing it to be of a semi- or full-blotch type shows a number of brush-like, almost white discharge marks all through the printing, continuing perhaps for a considerable distance through the run until all the vat color has been removed from the brush furnisher. This fault is of rare occurrence, however, and can only take place as the result of gross carelessness on the part of those in charge of such matters. The surest method is to keep brush furnishers for these purposes separate, or if this should prove to be difficult or too expensive, see that all furnishers that have been used for vat colors are thoroughly well washed, in the first instance in a strong solution of acetic acid, and afterwards well rinsed before being used for Azoics of any type.

• AN ELECTRIC EYE FOR COLOR*

Color-measuring instruments using the photoelectric cell have been developed to a stage of practical industrial usefulness, and the analysis, comparison, and matching of colors can now be established on a more exact basis than ever before. The use of instruments in industrial color work has been growing ever since Lovibond first developed glass color standards for standardizing the color of beer. Although the human eye and the immediate reaction of a color expert are entirely adequate for the majority of color questions that arise from day to day, instruments have become indispensable in many industries.

The older-type instruments depend on the judgment and visual response of the operator, and results are influenced by eye fatigue and especially by any abnormality of the operator's relative sensitivity to various wave lengths. In photoelectric instruments, a standard electric eye with known spectral sensitivity is substituted for the human eye, and the variable human element is reduced to a minimum. Such instruments make it possible to get more information in the same length of time. They can be adapted to the requirements of high-speed production. They can be relied upon for strict impartiality, and are thus especially well suited for use in referee work where specifications and commercial tolerances must be set, questionable goods must be checked against established standards, and colors must be described as to spectral distribution and intensity in definite quantitative terms.

Color is an important specification, and is used as an indication of quality or the basis of grading in a great many industries such as textiles, paper, food products, medicinals, beverages, building materials, as well as in the more obvious ones such as dyestuffs, paints, and inks. Great care is taken to maintain uniformity of color, and regular comparison of production with color standards is an important part of inspection in all cases where advertising or tradition has caused color to be associated with quality. For example, coffee must be roasted to a certain shade of brown; there is a correct color for each bottle of beer; in lubricating oils, color as well as lubricating properties must be properly standardized.

Color Matching

Rapid style fluctuations have increased both the difficulty and the necessity of accurately matching popular shades in widely varying material for hats, shoes, dresses, and miscellaneous articles. Different textile fibers such as rayon and cotton usually require different dye baths to produce the same color, and to secure a matched color in leather entirely different materials are required. It is also necessary for the colors to match under varying conditions of lighting. This is impossible unless the colors not only give the same over-all effect under a standard light, but also have equivalent spectral energy distribution (*i.e.*, reflect the same relative proportions of the various spectral components of light).

In certain chemical operations and in heat treatment of metals, the color in itself is not an important quality, but is a useful indicator for controlling operations and marking the completion of reactions. A universally known similar example is the use of color in cooking to gauge the progress of pies or biscuits in the oven.

Because of the infinite number of possible hues, tints, and shades, color cannot be described precisely in words, and although international standards have been recently adopted (*Industrial Bulletin*, March, 1932), color terms are used very loosely. Specifying and cataloguing must generally be done with samples which in practically all cases deteriorate with age. By means of a properly designed color instrument, permanent records could be in the form of photometric curves or numerical data.

There are many types of photoelectric color instru-

* Industrial Bulletin of Arthur D. Little, Inc.

ments, varying in complexity and function from simple instruments which respond merely to changes in total light energy to fully automatic recording spectro-photometers which produce curves, giving, for each color analyzed, energy at each wave length throughout the visible spectrum, expressed as the percentages of the energies in white light. Each type of instrument differs in some respect from the others. For example, in most of the instruments the light directed upon the sample has been made monochromatic by means of a prism, grating, or color filter, although in one type, at least, the light is broken up into its spectral components after being reflected from the sample. In certain of the instruments the sample is rotated in order to avoid errors due to weave, texture, or other form of non-homogeneity, although in one type of instrument such errors are obviated without the necessity for rotation. In some instruments intensity is indicated on a meter. In one type, relative intensity is recorded automatically on a moving chart; in another, intensity of reflected light is recorded on a photographic film. The number of points in the spectrum which can be measured is 3 in some, 6 in others, and practically infinite in others. Optical systems, photo cells, methods of regulating voltage or adjusting for voltage changes are different in various machines.

Obviously no one type is feasible for all color problems, and a careful survey of color problems and their relation to other phases of a business is necessary in order to get instruments which are satisfactory but not more complex than necessary. In many cases a specialized design or adaptation will be the logical selection. Color problems vary widely as to nature and number of significant variables, the accuracy and speed required in measurements, the wave lengths at which sensitivity should be greatest, etc. Cost of the equipment and operating expenses must be compared with that for alternative methods. Whether the instrument is to be operated by plant men practically as part of the production line or by a highly trained physicist in the laboratory must be taken into account. It should also be recognized that only in unusual cases can experienced personnel be supplanted by an instrument of this sort. However, in view of the wide range of instruments available, manufacturers wishing to take advantage of the new color technique should have no difficulty in securing instruments which can be effectively fitted into the routine of plant and laboratory.

• DYE PRODUCTION INDICATES ACTIVITY

The increased production and trade in dyestuffs reported from dye-producing countries indicates greater world activity in textile and other industries consuming dyes, according to C. C. Concannon, Chief of the Commerce Department's Chemical Division.

Production of dyestuffs in France in 1933 totaled 10,900 metric tons compared with 10,150 tons in 1932 and 9,200 tons in 1931; Italian production increased from 5,700 metric tons in 1932 to 6,200 tons in 1933. Japan's production of synthetic dyes increased from 1,552 metric tons in 1931 to 4,642 tons in the following year and to 7,690 tons in 1933.

German production is reported to have declined slightly in 1933 but complete recovery is looked for in the current year. Production statistics for the United Kingdom, Switzerland and the United States are not yet available. Production in the United States undoubtedly increased in 1933, Mr. Concannon stated.

Both Switzerland and the United Kingdom report increased exports of artificial dyes during the first quarter of 1934, compared with the corresponding period of last year, the former from 13,648,000 francs to 17,299,000 francs and the latter from L203,000 to L251,700. Germany's exports of all classes of dyestuffs were valued at 133,738,000 marks in the year 1933 compared with 133,662,000 marks in the preceding year although the volume declined from 29,142 to 26,818 metric tons.

Imports of synthetic dyes into the United States in 1933 were valued at $4,792,000 compared with $3,517,000 in the preceding year.

Reports from producing countries indicate, according to Concannon, that production gains made in 1933 will be maintained during the current year.

• GENERAL RELEASES

Chromoxane Brilliant Violet BE—a new chrome topped violet. When dyed in the usual way from an acid bath and after-treated with chrome it is said to produce bright violet shades of very good fastness to fulling, decatizing, carbonizing and potting. It is also claimed that the fastness to washing, water and salt-water, perspiration and hot pressing is also very good. Light fastness is fair.

Indanthrene Scarlet F 3 G Suprafix and Indanthrene Printing Brown T M Suprafix—two new printing colors. The former is said to produce a bright yellowish scarlet shade of very good fastness to light and excellent fastness to washing and chlorine. The latter is said to produce a full chocolate brown shade of very good fastness to light, washing and chlorine. Both products, it is stated, are best printed according to the usual potash-Rongalite process.

Fast Brown Salt R R—said to give full red-brown dischargeable shades on Naphtol AS-OL. It is also recommended by the distributors for print-on styles on the same naphtol ground.

Copies of the above named circulars are all available through the General Dyestuff Corporation.

• TRADE NAMED CHEMICALS

In order to assist users of The Chemical Formulary, a pamphlet listing many trade named chemicals and their suppliers has been issued.

All purchasers of this book prior to June 23rd, may receive a copy free by writing to The Chemical Publishing Co., 1450 Broadway, New York City.

Washington News Letter

The Federal Revolution Extends to Government Purchasing

By WALDON FAWCETT

NOT solely for the commercial interests which outfit the Government with equipment and supplies is there the significance of fundamental change in the new system of Federal purchasing. No less applicable the revolutionary influence to the forces of industry which, in any measure, depend upon standard Federal specifications for manufactured articles or derive technical knowledge from the tests which are conducted at Washington in verification of purchased commodities or in ascertainment of the quality of proffered items.

For, under the purchasing annex of the New Deal, these incidental activities, complementary to actual contracting, are consolidated with the machinery of purchase. Not to mention the inclusion of the warehousing of reserve supplies, an activity upon which the Government embarked as of comparatively recent date. The force of the cumulative influences thus summoned is already apparent in certain quarters. For example, in the additional pressure exerted in behalf of varietal simplification, and standardization of sizes,—objectives brought nearer by the revised policy which definitely commits the Government to acceptance, in the fullest possible degree, of commercial standards for staples.

Prior to the current remodeling, the purchase of routine materials and appliances for the Government Departments and independent bureaus at Washington was the responsibility of the General Supply Committee, a subsidiary of the Treasury Department. Under the new program, but just now attaining full stride, the Supply Committee is supplanted by the expanded Division of Procurement. The outfitting office survives in the new set-up as the Branch of Supply. Associated with this agency, in a relationship much closer than has heretofore existed, are the Federal Specifications Board, the Federal Contract Board, the Federal Stock Catalog Board, and the organization inaugurated a few years since to bring about systematic coordination of Government purchases.

On its face, the new program at Washington is a concerted move for centralization of the material maintenance and replacement activities of the Government. But, to draw a fine but vital distinction, this venture is not an adventure in geographical supercentralization of purchases. The enlarged establishment at Washington, with its shopping list of more than 129,000 separate items, will not attempt to take over the purchase of special, individualistic items required in this and that isolated office or laboratory. Equally to the point, this pyramided purchasing institution will not essay the purchase of the intimate requirements of the scattered "field offices" of the Government, albeit a dream of single-channel purchasing for the entire Federal community has long been the hobby of certain idealists in Congress.

The consolidation of specifying, requisitioning, purchasing and storage agencies which is the result of Executive Order No. 6166 might, perhaps, be described as an alliance for purposes of sympathetic policy-making rather than a merger to melt and fuse the sum of the Federal facilities of procurement. A primary objective is the attainment of uniformity in Federal purchasing policy. As a close second, comes the ambition to bring about economies in Governmental outfitting. How, if possible, this latter is to be attained, is already illustrated by the new policy of "definite purchases" as compared to the old plan of purchasing at indefinite prices or maximum prices, quoted to cover a long span. Likewise symptomatic of the new technique, is close ordering (preferably for coverage of needs within three months) and the taking of full advantage of discounts.

If the experimental equation be the dominant factor of the New Deal in general it is perhaps fitting that the purchasing revolution should lean heavily toward the explorative side. Here, confessedly, is the goal of the graduation of cooperative supply into glorified Procurement. As has been stated, the Division of Procurement is starting with no disturbance of bilateral purchasing,—no summary disruption of the elastic arrangements which have sanctioned independent purchases for special or singularly technical needs. But this observance of the status quo does not commit the new general staff of purchase to this policy for all time. Frankly, Rear Admiral Christian J. Peoples, Director of Procurement, has interpreted the function of his institution as one of ascertainment and appraisal. All existing outfitting and storage methods will be weighed in the balance. And ultimately, the intention is to carry mass purchasing and interdepartmental warehousing as far as they may economically go.

In a word, consolidation or centralization will be invoked wherever and whenever "economies are obvious", to use the Director's own phrase. There may be, in some instances, centralized control even when there is decen-

tralized operation in purchasing. But, it is likewise assumed that there will always be minor or unique projects in outfitting which must remain outside the grooved pattern. To separate the one class of purchases from the other and then carry mobilization to the warrantable limit is the initial task of the Procurement staff. Analyzing the sources of Government wants, the volume of requisitions, and the intervals at which replacements are required, the experts will attempt to determine, in every commodity classification, what are, for the purposes of the Government, items of "common supply". The trials, the date, indicate savings for the Government, running as high as 20 per cent under stress of the new range of consolidation.

Having taken the measure of the Federal buying habit in any commodity lie, the Division of Procurement has the choice of four formulae for making savings and simplifying purchase. As the obvious and conventional gesture, the Director of Procurement may set up an agency of the Government to handle (presumably in one place) all purchases in a given line. But he is powered with an alternative, which he has announced his intention to employ on occasion,—viz, delegation of purchase to an existing agency or agencies. As solution No. 3 there is slated the creation of the special purchasing agency which would devote itself to Government purchases, but purchases of highly selective scope rather than mass contracting for broadly-consumed essentials. Finally, the Procurement Director has it within his power to employ a combination of the methods above indicated.

The whole spirit and intent of the new system of Procurement is to contribute to the elasticity of the Governmental outfitting arrangements and, particularly, to relate purchases more closely to current needs, taking advantage of market fluctuations which benefit a mobile purchaser. Definitely in the discard is the old procedure whereby bids were invited for an indeterminate quantity of goods to be delivered, at demand, at any time within a year, at an upset price. Under the new formula, 6 months is the maximum duration for a continuing contract, with preference for a term just half that duration.

Not the least of the economies claimed for the new program are the savings on the paper work of outfitting. Fewer contracts, purchase orders, and paying vouchers should, of course, spell conservation at the source. To the same end, the slack is being taken up in every operation from the advertising for bids to the final auditing of the vouchers. In the same key is the reformation of storage methods. Duplication of storage facilities has been an economic crime from which Governmental outfitting has long suffered. The new warehousing facilities, aggregating 1,000,000,000 feet of storage space, may automatically cure the situation at Washington but much remains to be done in the field in reduction as well as in consolidation of stocks. Integral to this part of the program is the attempt to provide, at the time of delivery of goods, whatever inspection may be requisite.

● CODE AUTHORITY ANNOUNCEMENT

As a measure to prevent and control trade practices that might tend to break down fair competition agreements, all claims of $100 or over made by customers of rayon and silk dyeing and printing firms will in the future be adjusted by the Code Authority for the Rayon and Silk Dyeing and Printing Industry, it was announced on Monday, May 14, by General William N. Haskell, executive director of the Code Authority. The new ruling was adopted at a meeting of the Code Authority and will be effective on and after May 15th.

"Such action was deemed necessary at this time," General Haskell explained, "in order to assist the concerns in the industry to reduce to a minimum and to eliminate entirely, if possible, unjust claims on the part of certain converters.

"Individual claims have run from as low as a few cents to as high as $5,000. In the course of a year, at the present rate of presentation, aggregate claims would approximate three and a quarter million dollars. Many of these claims are not made in good faith, many are subterfuges and might be used as undercover agreements to cut prices. Of course, however, a vast number of claims for shrinkages, shortages, damaged goods, billing and price errors, misprints, wrong shades, measurement errors, etc., are legitimate.

"The provisions of the Code for this industry provide that eventually all claims will be adjusted by the Code Authority. The taking on of all claims of $100 or over is a further step towards this fulfillment. As has been the rule in the past, however, the Code Authority will continue to adjust all claims under $100 for any firm that may desire the Bureau to do so.

"Claims adjusted by the Code Authority's Central Claims Adjustment Bureau through the option of individual firms have grown from 300 a week in February and March to approximately 750 in April. More than 800 claims were reported by the Bureau in the first week of May."

ADDITIONAL CLASSIFIED

WANTED—Experienced ribbon dyer, piece and yarn dye, silk rayon and acetate. Penna. mill. Give full particulars, experience, age, salary expected. Confidential. Write Box No. 819, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

POSITION WANTED—Young man, three years' experience with dyeing and bleaching and technical education, desires position as Assistant Chemist or Laboratory Assistant. Hard worker and can easily adapt himself to any work. Write Box No. 820, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

JULY 2, 1934

Officers of National Association

ROBERT E. ROSE, *President*
E. I. Du Pont de Nemours & Co., Wilmington, Del.

A. R. THOMPSON, Jr.—ALEX MORRISON, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline & Chemical Co., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

Councillors

JOSEPH F. X. HAROLD — **WILLIAM D. APPEL**
DONALD H. POWERS — **HUGH CHRISTISON**
CARL Z. DRAVES — **WALTER M. SCOTT**

President Emeritus and Chairman of the Research Committee
LOUIS A. OLNEY
Lowell Textile Institute, Lowell, Mass

Council Representatives: Northern New England—Roland E. Derby, New York—Hans Meyer, Philadelphia—Harold B. Dohner, Midwest—Carl E. Bick, South Central—G. H. Dubois.

Local Sections and Their Officers

Northern New England Section
Roland E. Derby, Chairman, M. T. Stevens Co., No. Andover, Mass.
Clarence L. Nutting, Secretary, Arlington Mills, Lawrence, Mass.

Rhode Island Section
Heyward F. Lawton, Chairman, Borden & Remington Co., Providence, R. I.
C. Brian Wainwright, Secretary, Apponaug Co., Apponaug, R. I.

New York Section
Ephraim Freedman, Chairman, Bureau of Standards, R. H. Macy & Co., Broadway and 34th St., New York, N. Y.
P. J. Kennedy, Secretary, E. I. duPont deNemours & Co., Inc., 61 Thomas St., New York, N. Y.

Philadelphia Section
William A. Stringfellow, Chairman, Ankokas Mills, Mount Holly, N. J.
Charles A. Seibert, Secretary, 39 Chestnut St., Salem, N. J.

Piedmont Section
George P. Feindel, Chairman, Union Bleachery, Greenville, S. C.
John C. Robertson, Secretary, E. I. duPont deNemours & Co., 5 Pettigru St., Greenville, S. C.

South Central Section
Harold Schroeder, Chairman, Dixie Mercerizing Co., Chattanooga, Tenn.
Harvie Bruce Kimbrell, Secretary, Dixie Mercerizing Co., Chattanooga, Tenn.

Midwest Section
Eric F. Hempel, Chairman, National Knitting Co., 2165 South First Street, Milwaukee, Wis.
Elmer F. Smith, Secretary, American Aniline Products, Inc., 820 S. Clinton St., Chicago, Ill.

South-Eastern Section
Charles B. Ordway, Chairman, Alabama Polytechnic Institute, Auburn, Ala.
C. A. Jones, Secretary, Georgia School of Technology, Atlanta, Ga.

Lowell Textile Institute Student Section
Raymond L. Matthews, Chairman; Charles L. Daley, Secretary.

North Carolina State College Student Section
H. S. Bliven, Chairman; D. B. Hardin, Secretary.

Members should notify the **Secretary** immediately of all address changes

EIGHTY-NINTH RESEARCH COMMITTEE MEETING

THE 89th Research Committee meeting followed the Council meeting at the Engineers' Club of Boston, on Friday afternoon, June 15th. Present were Louis A. Olney, presiding; W. H. Cady, Hugh Christison, Carl Z. Draves, Walter C. Durfee, Ralph Hart, Hans Meyer, William R. Moorhouse, George A. Moran, Donald H. Powers, Walter M. Scott, and Harold C. Chapin.

A telegram was received from Dr. Harold regarding reorganization of the Sub-Committee on Standard Methods of Chemical Analysis and Testing. Mr. Durfee expressed his desire for a collection of analytical methods for choice of the user, rather than standardization of methods; but it was pointed out that there is need also for standard methods upon which, even though they be not the best, the buyer and seller of material can find a basis for agreement.

Mr. Christison urged concentration upon a few specific problems. In line with his suggestions he was appointed to organize a Sub-Committee on the Determination of Oil, Soap, and other Non-Fibrous Foreign Matter in wool; and Claxton Monro to organize another Sub-Committee on the Determination of Fibers in Mixtures. It was recommended that the latter committee first study the quantitative separation of cotton and wool. Mr. Hart reported for the Sub-Committee on Methods of Analysis of Sulfonated Oils.

The Chairman, reporting on Textile Foundation projects, announced the organization of a sub-committee advisory to Dr. Harris in his work on the effects of alkali on wool, comprised of Alban Eavenson, Chairman; W. D. Appel, G. E. Hopkins, H. A. Neville, and D. H. Powers.

Reporting for the Sub-Committee on Fastness Tests for Dyed Wool, Mr. Christison stated that three dyes satisfactory for washing standards had been selected, but that the fourth was still a problem. His suggestion of a mixture of dyes to give the desired combination of bleeding and loss of shade received approval from Dr. Meyer and Mr. Moorhouse, on condition that a mixture be found which would give consistent results; they taking the ground formerly expressed by Mr. Appel, that standard dyeings rather than standard dyes are the fundamental requisites, though specifications for the dyeings are necessary.

Respectfully submitted,
HAROLD C. CHAPIN, *Secretary.*

Proceedings of the American Association of Textile Chemists and Colorists

Soaking Silk* for Direct Knitting

By **W. W. BRAY**

Director of Textile Research, The Procter & Gamble Co., Ivorydale, Ohio

KNITTERS of full fashioned silk hosiery have for some time clearly expressed their demand for a direct running silk. They have tried in many ways to eliminate backwinding, an expensive process. They are anxious to eliminate conditioning in humidified rooms, which is only partially satisfactory and likewise costly. In order to do this they must have a silk which can be taken from the package delivered by the throwster, placed in the humidifying boxes of the knitting machines and run directly through wicks to the needles.

The knitters' demand puts the problem up to the throwster. The treatment necessary to impart direct running qualities to the silk must be given in the soaking previous to throwing. This immediately increases the difficulty of the problem. Apparently a very simple operation, silk soaking, is in reality one of considerable complexity. An analysis of the factors which influence the operation and which require control is alone sufficient to prove this point. In addition, an extremely aggravating complication is introduced by the difficulty of measuring or judging accurately the results of a given set of soaking conditions. The uniformity and effectiveness of lubrication, the nature of the changes which take place in the silk gum, and the ever debatable degree of softness, are qualities which there are no instruments to measure and interpret accurately. Only practical knitting tests can serve for comparison and here is encountered a new set of variable factors which require control.

As a result of these complications, straight thinking about silk soaking has been extremely difficult. However, throughout the past year our Textile Research Department has devoted considerable theoretical and practical study to the needs of soaking silk for direct knitting, to the materials available for use, and their effects on the silk. It may be interesting to indicate how the problem was analyzed and what results the extensive experiments led to.

The Purposes of Soaking

The surface of raw silk is extremely harsh. Its frictional effect towards metal or porcelain machine parts is so great that attempts to throw the silk as received would quickly ruin various parts of the machinery. Porcelain guides, for example, are quickly cut by the passage of dry silk. It is, therefore, necessary to lubricate the fiber thoroughly to reduce the friction on the throwing, and later on, the knitting machines.

The harsh surface of the silk likewise interferes with twisting. Friction between threads prevents their sliding smoothly over one another and leads to uneven distribution of the twist. Again, surface lubrication is necessary to reduce this friction.

Besides being harsh, the gum coating of raw silk is likewise stiff and brittle. This is a most undesirable quality in a yarn to be used for direct knitting. For this operation the yarn should be completely pliable. It should bend easily and in a round loop rather than breaking in a pointed or square loop. Consequently, the raw silk must be treated in such a way as to make the gum coating pliable and more nearly like the true silk fiber inside.

In the trade a treatment of this type is often referred to as softening the silk. The term soft silk is not strictly accurate since it combines the effect of a well lubricated surface with a feeling of "give" when the silk is compressed in the hand. Hardness or softness, literally used, do not necessarily effect knitting. Pliability is the important quality and is, therefore, a more accurate term to use.

Methods of Accomplishing These Purposes:

Lubrication

Since friction exists between one surface and another, the preliminary requirement for the elimination of friction is the existence of a film of oil between the two surfaces in contact. This means that the proper lubrication of the silk thread involves coating the thread with a thin but uniform film of oil. Conceivably, this lubrication might be obtained by direct application of oil to the silk. However, an excess of oil beyond that absolutely necessary is most undesirable and when we come to use the minimum amount, the difficulties of distributing the oil uniformly are so great that direct application of oil to silk is rarely if ever attempted.

In order to distribute the oil uniformly over the surface of the silk, the small volume of oil necessary is dispersed in a large volume of water. Thus the primary reason for using emulsions to soak silk is to obtain adequate distribution of the lubricating oil.

To be satisfactory for lubricating silk, an emulsion must have two definite characteristics. First, the oil particles must be fine enough and uniform enough to give a good distribution throughout the bath. It is important that the dispersed oil particles all be nearly the same in size. If one of two neighboring particles is 10 times the size of the other, it is quite obvious that the thread upon which these particles come to rest, will not be uniformly covered

* Presented at April Meeting, Philadelphia Section.

with oil. Also, the particles must be small enough that the emulsion can be kept for a reasonable time. If the particles are too large, they tend to separate out, coming to the top of the emulsion and forming either a free oil layer or a cream layer. The emulsifying agent and the agitation used in preparing the emulsion must be adjusted to one another and to the system so as to produce particles fine enough and uniform enough to prevent any separation or creaming for a period of several minutes. In other words, no separation should take place between the time when the emulsion is prepared and the silk is entered.

The second requirement of a lubricating emulsion for silk is the ability to break down at the desired rate and separate out on the silk. A consideration of what takes place when the silk enters an oil emulsion will illustrate this point. The silk enters a bath in which small oil droplets are uniformly distributed. The dry silk is completely submerged and the effective penetrating power of the bath in wetting-out the silk carries the emulsified oil particles to all parts of the bundle of silk. When an oil particle comes in contact with the silk, there is a conflict between the attraction of the silk for the oil particle and the ability of the emulsifying agent to protect the oil particle and keep it from being thrown out of the emulsion. It is, of course, desirable that the emulsifying agent should lose after a brief struggle. The emulsifier should hold the oil particle with sufficient tenacity to make sure of uniform distribution; in other words, to prevent all the oil separating out on the outside fibers of the bundle of silk so that the interior of the bundle receives no lubrication. On the other hand, if the emulsifying agent holds the oil too tightly, the proper separation may never be obtained and the oil will not accomplish its purpose.

One of the most useful materials for preparing an emulsion of this type is soap. With a properly chosen soap it is a simple matter to prepare a soaking emulsion of the desired degree of stability to prevent separation before the silk is entered. Soap emulsions likewise resist immediate separation when the silk is entered because there is an excess of soap present. However, when the emulsified oil particles, each surrounded and protected by a thin film of soap, have been distributed uniformly throughout the silk due to the excellent wetting power of the excess soap, a slow reaction begins which gradually brings about an almost complete separation of the emulsion. This reaction is the normal attack of the alkalinity of the soap on the silk gum which is acid in relation to soap. After the soap alkalinity is absorbed by the gum, the protective effect of the soap in keeping the oil droplet emulsified is reduced. The attraction of the silk for the oil becomes greater than that of the weakened soap and, therefore, the oil sticks to the silk and remains to provide lubrication. This process goes on at every available point on the surface of all the silk threads in the bath and the result is a uniform coating of oil and a uniform conditioning action on the silk gum.

Pliability

Theoretically, there are two ways of making the silk gum pliable. The method which is well understood and widely used obtains this result through absorption of moisture by the silk gum. With the gum in its normal state, this can be done only with difficulty, as by backwinding. However, it can be made far easier by treatment of the gum to break down its harshness, stiffness and water resistance. A partial result of such a treatment is a great increase in hygroscopicity or moisture absorbing ability of the silk gum.

Another possible way of making the gum pliable is by impregnation with a suitable substance other than moisture. It has been argued that this method is the more desirable since it would render the knitter completely independent of wet or dry weather conditions or special mill conditioning. This view does not take into consideration the normal moisture absorbing quality of the silk and the consequent fact that variations in atmospheric moisture will have a larger influence on a relatively dry yarn than they will on one which is almost completely wet. Moreover, this second possibility is not likely to become a reality because considerable experimentation has revealed no substance which imparts the desired pliability to the thread. Nevertheless, it is true that absorption of soap, oil, or compounded oil, into the interior of the gum layer, does appear to break down the structure of the gum and provide internal lubrication of some sort. As a result the dry pliability of the silk is materially increased by some degree of impregnation with the normal soaking materials.

The gum treatment, which effectively increases both wet and dry pliability of the silk is, in general, an alkaline action. Indeed, it is probably the same reaction which takes place when silk is degummed. However, in soaking silk it must be controlled so that little or no gum is actually removed from the fiber.

Alkaline action, of course, can be obtained from a number of products. Borax and sodium bicarbonate are alkaline towards silk but, nevertheless, so weak that their effect is hardly sufficient. Sodium and potassium carbonates are stronger and quite effective alkalies, while trisodium phosphate is still more highly alkaline. These products are likely to be dangerous and, hence, should be used only with a thorough understanding of their behavior and the amount needed. Modified sodas which represent approximately equal mixtures of sodium carbonate and sodium bicarbonate are less dangerous and widely recommended.

The class of alkaline compounds which is best suited to conditioning silk gum so as to increase its ability to absorb moisture is soap. Here, as in the related process

of degumming silk, soap has been proven by experiment and practice to possess many advantages over the more elementary alkaline compounds such as those just discussed. Soap offers a perfectly controlled supply of alkalinity which, if the soap is carefully chosen, is of just the right intensity to produce the desired effect on the silk. The amount of conditioning or the degree of hygroscopicity produced in the silk seems to be directly proportional to the per cent of soap used. Moreover, even if used in an extremely large excess, soap causes no damage to the silk at the temperatures used in soaking silk. Soakings consisting almost entirely of 25% and 50% soap have shown no degumming whatever in the soaking bath and no stripping later on during knitting. In this connection, the accumulation of deposits on the knitting machine known as stripping which has sometimes been attributed to scraping off soap, has been definitely proven to be in most instances the result of a mixture of oil with the compounds formed from water hardness. In brief, soap is a very desirable conditioning agent because it is effective, automatically controlled, flexible in use and, moreover, fulfills several other functions in the soaking process.

It has already been suggested that considerable impregnation of the silk gum and possibly of the inner silk fiber takes place during soaking. Indeed, it is probable that a majority of the soaking ingredients removed from the bath by the silk penetrate to a greater or less extent beyond the surface of the silk. However, it is extremely difficult to define the condition of affairs under the surface because of the varied and complicated nature of the products which may be absorbed.

There is undoubtedly a considerable absorption of neutral oil. This cannot, however, take place with the oil in the form of emulsified particles since even the smallest are probably many times larger than any pores or openings there may be in the structure of the silk gum. The absorption more likely takes place from the oil film deposited on the fiber surface and resembles the absorption of water by a sponge. The effect of this oil absorption is possibly an internal lubrication tending toward greater pliability of the gum.

Soap is absorbed probably in almost as many forms as it exists in the solution. First, there is soap in molecular form which will be absorbed by a process of diffusion like any other salt. Second, there is ionized soap of which the alkaline portion will be absorbed more quickly and possibly in preference to the fatty acid radical. However, the latter as fatty acid or as acid soap, will be deposited on the fiber and later absorbed in somewhat the same way as neutral oil. Colloidal soap is also present but it may not even become attracted to the fiber. It must be remembered, however, that the alkaline product of the hydrolysis of soap is constantly being used up so that the equilibrium of colloidal, crystalloidal (molecular) and ionized soap originally established, is constantly being disturbed. The result will be a tendency for colloidal soap to change to the crystalloidal form and then ionize. Hence, in the end probably relatively little colloidal soap remains.

The effects of the sorption of soap aside from the conditioning of the gum, and the hygroscopic effect, are a slight swelling of the fiber, a fatty type of lubrication and a slipperiness of surface which aids lubrication. The sorption of soap and oil applied in the proper proportions combine with the conditioning of the gum to give a very desirable effect on the silk. It is not a difficult problem to adjust these two materials so as to produce a highly satisfactory direct running silk.

Preparations of Emulsions

The preparation of effective silk soaking emulsions from soap and neutral oil is easy when the correct methods are followed. The first step is the preparation of a stock solution of soap containing one pound of soap flakes per gallon of solution. For example, if 80 gallons of solution are to be made, 80 pounds of soap flakes should be weighed and placed in about 40 gallons of cold water in the tank. The mixture should be stirred briskly to wet out the flakes and prevent the formation of lumps. Then open steam should be turned on to heat and agitate the solution. In a very few minutes, the flakes will be completely dissolved and upon the addition of the remainder of the water and stirring, the solution is ready for use.

The value of such a stock solution is that measurements of the soap can be made by volume to the soaking tub. The number of gallons of soap used represents exactly the number of pounds of soap desired. The oil likewise can be measured in liquid form by volume and should be added in a slow stream to the concentrated soap solution in the individual soaking tub. Vigorous stirring with a paddle or mechanical apparatus forms a fine emulsion at this point. With the concentrated emulsion formed, the addition of water to make up the full volume of the tub and to adjust the temperature, dilutes the emulsion to a usable concentration. When the water is all in, a vigorous stirring should be given to make the emulsion uniform. Then the silk should be added immediately or as soon as possible.

Soakings made with such emulsions have been thoroughly examined for possible variations in take-up by the silk. Skeins have been selected from the top, middle, bottom and sides of numerous 100-pound tub soakings and subjected to boil-off and extraction tests. In no case where the emulsion was properly made did these skeins show any greater take-up variations than skeins soaked in any other type of emulsion. Therefore, it can be confidently asserted that properly made soap-oil emulsions will give highly uniform soakings.

The Choice of Soap

The properties of a soap which make it desirable for use in silk soaking are five:

1. It must be highly soluble so that concentrated stock solutions can be prepared and kept liquid without separations of solid matter at low temperatures.
2. It must be an efficient oil emulsifier at low temperatures.
3. The soap should be unusually mild, liberating its alkalinity as slowly and to as low a degree as possible.
4. The soap itself should be as soft as possible so that after being absorbed by the silk and dried, it will actually soften the silk instead of drying to a hard, harsh film and making the thread stiffer.
5. The soap should be resistant to oxidation so as to prevent the changes which develop rancidity and weaken the silk yarn.

These qualifications point directly to flaked sodium oleate, which embodies these properties to the highest degree among all types of textile soaps.

Conclusions

Theoretical considerations as well as experimental results both in the laboratory and in many throwing mills have proven conclusively that flaked oleate soap and olive, or an equivalent neatsfoot oil, are unusually well adapted for soaking silk to produce a truly direct knitting yarn. This combination of materials has five outstanding advantages:

1. Low cost to the throwster.
2. Simplicity because of fewer materials and elimination of multiplicity of formulas.
3. Accurate control of the soaking operation.
4. Excellent and consistent knitting.
5. Saving of time and expense to the knitter.

The silk produced with sodium oleate and oil makes backwinding and conditioning operations unnecessary. Therefore, it may be truly called a direct running silk. It carries the knitter a long way toward complete independence from varying atmospheric moisture conditions.

Discussion

Mr. Stafford: I should like to ask on this new type soaking what has been your experience on the elasticity of the silk in comparison with the old way of soaking?

Mr. Bray: We haven't found any loss in elasticity of the silk by the gum conditioning.

Mr. Stafford: Possibly if I put it this way: Would you expect the diameter of the silk when knit would be finer with the old method as against the new?

Mr. Bray: The diameter of the silk thread itself?

Mr. Stafford: Yes.

Mr. Bray: That, I think, depends upon the amount of materials with which you impregnate or charge the silk, that is, the difference between the raw soaked boil-off. Obviously, the more that you put on, the greater the possibility of swelling the fiber. That also, I believe, depends upon the moisture it contains.

Mr. Stafford: In using silk after backwinding, that silk has been penetrated more than I would expect in the new type of silk. In other words, in the new type has that moisture penetrated all the way through the fiber? Has it become softened as much? If it has, then the elasticity would be the same. If it has not, the elasticity would be less.

Mr. Bray: That is the way I see it. A silk soaked in a manner which requires it to be backwound before knitting will not absorb moisture very readily. Backwinding is a process of forcing moisture into the silk, as is also, in a slower way, the conditioning of silk in a humidified room. That means that the old style absorbs moisture more slowly. Now, one of the things that we aim to accomplish in a silk intended for direct running is to give you more rapid moisture absorbing qualities.

Mr. Stafford: But equal?

Mr. Bray: Probably equal in the end. A direct running silk must take up moisture rapidly and evenly through the devices on the knitting machine for giving it moisture, humidified boxes and wicks. That means it must have the ability to take up moisture more rapidly than silk which is intended to be backwound before knitting. The elasticity depends upon the moisture contained, to a certain extent. If the direct running silk absorbs the moisture to the same degree on the knitting machine, then its elasticity would be approximately the same as the backwound silk.

Mr. Stafford: Would you expect to get the same result in machine soaking as in tubs?

Mr. Bray: Our experiments have not been greatly concerned with machine soaking so that I cannot give you a complete answer to that question. Undoubtedly the formula would be modified to suit the conditions in machine soaking.

Mr. Stafford: The break-up of emulsion would be varied?

Mr. Bray: Yes, and the attack on the alkalinity, the conditioning of the gum itself would have to be done more rapidly. However, that is somewhat taken into consideration by the greater rapidity of distribution of the emulsion in the case of machine soaking. Circulation directs it more quickly to the individual fibers.

Mr. Stafford: At what pH have you found the best results?

Mr. Bray: That question reverts to the type of alkaline compound that is used in the soaking process. Sodium oleate alone in solution will give you a pH in the neighborhood of 10 to 10.2. As you emulsify the oil, of course, this pH is reduced to some extent. When the silk is entered, the pH is reduced still further, but that means,

you might say theoretically, a starting pH of approximately 10.

Mr. Stafford: You keep it always on the alkaline side?

Mr. Bray: Yes, it ultimately may go as low as 7 on a prolonged soaking. The greater length of time you give it the more the pH will fall to the neighborhood of what might be termed the pH of the silk gum, but ordinarily I do not think you will go as far down as 7.

Mr. Jordan: There seems to be a tendency towards sulfonated oil for soaking. This is somewhat on the increase, I would just like to have your opinion as to which you consider the better of the two. What would be the efficiency against the soap soak?

Mr. Bray: I think I have indicated that we feel that soap is the preferable product. There is a great deal of detailed discussion that could be gone into on the relative merits of the two products. As to the out and out matter of efficiency I do not think there is any question but that the absorption or the efficiency in use of the soaking materials is very appreciably greater from a soap than from a sulfonated oil emulsion.

Mr. Jordan: It seems that the opinion is greater penetration from the sulfonated oils. It seems to be coming in pretty much.

Mr. Bray: In our experiments it seems to us that the penetration, the conditioning and the general type of lubrication from the use of soap give a superior direct running silk. The results have to be judged pretty much by actual knitting tests, and I think I can say we have been reasonably successful in developing a silk that will run direct.

Mr. Fancourt: There was some remark made about the old and new soaking. The old soaking was always soap and a straight oil, such as olive, running probably around 5%. I understand your remark that by using only 8% that you obtain hygroscopicity in conjunction with the oil whether it is sulfonated part way, mineral or vegetable oil. Hasn't it been the experience of years that hygroscopicity for direct knitting cannot be obtained by any oil soaking unless a proper pH value is obtained in the bath, because when that drys you have a film of oil which is water resistant? The emulsion is only made by free fatty acids and hygroscopicity of the soap.

Mr. Bray: The emulsion is made by subdividing the neutral oil or glyceride into small particles and then protecting those particles with a film of soap. That is the most acceptable theory of emulsification that I know of. I quite agree that the matter of pH in the soaking bath is highly important from the standpoint of making the silk hygroscopic or moisture absorbent, and with the soap soaking that pH is automatically attained by the soap itself. That is, the normal hygroscopicity of the soap gives a pH which is very desirable and effective in conditioning the gum. The degree of conditioning or the extent to which the silk is made hygroscopic is very easily controlled by the proportion of soap used in the soaking.

Mr. Fancourt: Isn't it a fact that even hygroscopicity in your soap in the presence of an oil such as olive, that a film is on the surface of the silk more than the soap? Therefore, you have resistance to the water for direct knitting.

Mr. Bray: The oil is deposited as a film. As I tried to outline, we think a film on the surface is desirable for a proper degree of lubrication. Absorption is also desirable and that takes place according to the materials you have used in the bath, to a greater or lesser extent. The oil is absorbed not as individual emulsified particles, but from the film which has been formed on the surface, so that some oil remains on the surface where desired, and some penetrates inward apparently giving us a help in producing a pliable thread.

Mr. Fancourt: The oil does lubricate, and being on the surface more so than the soap, it has a retardant action.

Mr. Bray: With satisfactory conditions in your soaking bath, whatever the distribution of the oil may be, the practical result is that you can get any degree of hygroscopicity or moisture absorbing quality that you desire. The presence of the oil as a lubricating agent on the surface or interior does not retard the absorption of moisture when the proper soaking conditions have been established.

Mr. Arnold: What do you consider the proper particle size in soaking if it is important to have the particle size within a definite range?

Mr. Bray: The matter of exact measurement of the particle size is a pretty difficult determination to make, but a relatively easy thing to control practically. Our approach has been from a practical standpoint, judging the results of the soaking by the results of the knitting, and by such other determinations as can be exact, such as boil-off and extraction results and tests to determine uniformity of take-up throughout the tub. From this practical approach we have reached the conclusion that an emulsion prepared in the manner I described is a satisfactory emulsion in particle size and uniformity to give the desired effect, and uniform effect throughout the batch.

Mr. Arnold: You have to have a rather definite ratio between the amount of soap used and the amount of oil. What do you find most satisfactory?

Mr. Bray: A definite ratio between soap and oil is apparently not the controlling factor in producing a satisfactory emulsion. For example, if you consider merely the finished particle size and stability of the emulsion, you can get probably greater stability with a lower proportion of soap than is customarily used in silk soaking. The soap is used not only for its emulsifying action, but also for its gum conditioning and other effects. In practice,

a higher ratio of soap to silk is used than if emulsion particle size alone were considered. The increase in the ratio of soap to oil above the proportion of soap necessary to produce good emulsion, does not greatly affect the particle size of the emulsion. I think we can put it this way: A certain minimum amount of soap is necessary to form the protective coating around the oil particles. An excess of soap above that is present in the bath in the various conditions I talked about. Unless you get a very high excess it does not have a great effect on the fineness of the emulsion.

Mr. Arnold: Would you consider it necessary to have olive oil or isn't that so important in getting the proper degree of free fatty acid?

Mr. Bray: We prefer an oil which is low in free fatty acid. I don't mean one with 1/10%, but free fatty acid content up to, say 5%, doesn't seem to affect materially the result in the soaking. That means that a commercial grade of oil is satisfactory, subject to the normal free fatty acid limits in commercial olive oil.

Mr. Arnold: Recently there have come on the market a number of oil soluble emulsifying agents. I should think that sort of thing would be rather useful and might go along with an oil more readily and assist the water take-up. It would be more easily carried out of the silk than soap, for example.

Mr. Bray: Our tests have not indicated that what you term oil soluble emulsifiers are necessarily any better in the sense of impregnating fibers with desirable materials. We spoke of the lower take-up obtained from emulsions made with some materials of that type. Our view of the reason for that lower take-up is the fact that such emulsions may be too finely dispersed to give a proper degree of separation and take-up by the silk for good economy.

Mr. Arnold: Don't you think an emulsifying agent which might disperse water would assist water to penetrate the film of oil on the surface of the fiber?

Mr. Bray: You mean to form a water-in-oil emulsion? All the emulsions that we know anything about for silk soaking have been of the oil-in-water type, not water-in-oil.

Mr. Arnold: What I mean is an emulsifying agent to start with which would be soluble in an oil, and go onto the fiber when oil is passed through water, would take up the water and assist in wetting-out the fiber.

Mr. Bray: I think a point there is the fact that it is easier to impregnate a fiber with a water soluble material than with an oil soluble material. That means that soap in the molecular form is more easily absorbed by silk than any other material we have, whether oil or compounded product. The oil has to separate on the surface before it can be absorbed. Soap in solution goes in far more easily by diffusion.

Mr. Quinlan: Has there been a soaking solution at the throwsters perfected to successfully knit a multiple twist yarn, grenadine or crepe, direct from the cone?

Mr. Bray: I see no reason why the general type of soaking that is effective on tram yarn should not be effective on crepe yarn. Experiments we have been making have been pretty much confined to tram yarns. We have gone into higher twists there and find it perfectly possible to impart direct knitting qualities.

Mr. Quinlan: How high is the twist?

Mr. Bray: 20 turns.

OUTING, NORTHERN NEW ENGLAND SECTION

THE regular meeting of the Northern New England Section was held June 8th in the form of the Annual Outing, at the Andover Country Club.

The weather was perfect, apparently made to order by Geo. Linberg, Chairman of the Outing Committee. The golfers and tennis players made the most of it, too. The Old Guard showed their stuff on the links, courts and baseball field and even the quoits received their annual polishing. So, when the dinner bell rang at 7:30 there were 105 ready to do justice to the excellent dinner. Prizes for the winners of the afternoon contests were awarded by Chairman Linberg as follows:

Scotch Tam-O-Shanter to Mr. Leverett Putnam, first retiring grandfather Chairman of this Section.

First low net to Mr. John Grady, low net of 71.

First low gross to Mr. Phillips Graham—78.

Long driving contest, George O. Linberg.

Putting contest, Milton J. Washburn.

First prize, tennis—Dr. Walter Scott.

Second prize, tennis—William Smith.

First gross, visitors' prize—T. Healy.

First net, visitors' prize—William Brandy.

Honorable mention in horse shoes and baseball—Archie Innes, Joe Travers, Harry Finley.

Geo. Linberg's Committee set a new precedent by turning over to Treasurer Grady a balance of $4.75.

From the results of the annual election, the following officers were announced for the year 1934-1935:

Chairman: Roland E. Derby.

Secretary: Clarence L. Nutting.

Treasurer: John H. Grady.

Sectional Committee: John M. Dalton, Elmert E. Fickett.

Representative to National Council: Roland E. Derby.

Representative to National Nominating Committee: Carl Z. Draves.

Curfew at 9:30 sent the "gang" on their way toward home with everyone agreeing that a "good time was had by all."

Respectfully submitted,

CLARENCE L. NUTTING, *Secretary*

Proceedings of the American Association of Textile Chemists and Colorists

Some Milestones in the History of the Chemical Processing of Textiles*

By EUGENE R. MANNING
Head of the Department of Chemistry and Dyeing of Clemson College

THIS subject differs from those of a scientific nature generally presented before such meetings, but we trust it may prove interesting to some of those present who may possibly welcome a departure from the topics which are quite familiar to us in our daily life.

The development of an industry is generally so slow that one is sometimes surprised when he realizes the effort expended in the acquisition of the knowledge relating to the simple things of our everyday life.

The development of our textile industry presents just such a surprise.

It is only possible to give a recital of the things of most importance in the short time allotted for this paper, so we will do our best to present as many facts as possible in their chronological order and more in the form of an outline than that of a story.

What is probably the earliest reference to a textile is one to a cloth made of flax some ten or twelve thousand years ago by Neolithic Man who fashioned his material very crudely.

The first reference to cotton in European countries is embodied in the statement that Alexander the Great after leading his conquering armies over Arabia, Persia, and India returned to Greece with a strange substance which he termed "vegetable wool." This was undoubtedly some variety of our present well known cotton plant. Alexander then founded the city of Alexandria in Egypt and this plant was extensively cultivated in this neighborhood for thousands of years, and even today this section produces some of the world's finest cotton.

The story of the introduction of silk into Europe is quite interesting. It relates to two missionaries who during the Sixth Century, hid a quantity of silkworm eggs in the hollow of a cane where they were preserved until the missionaries could journey from Nanking, China, to Southeastern Europe where the eggs were presented to the Emperor Justinian. This resulted in an extensive silkworm industry in Southern Europe. Note the benefits derived by the "heathen Chinese" from his teachings by the Christian missionaries. The Ten Commandments must have been very impressive under such circumstances!

Wool was discovered when the Romans conquered Britain. The inhabitants were dressed in a cloth of coarse felt made of wool.

At the beginning of the Christian Era the textile art was quite highly developed since mixed fabrics of linen and wool and linen and silk were being produced. Textiles were being made in the Western Hemisphere before it was discovered by Columbus. Shortly after landing on these shores, he saw Indians reclining in hammocks. Cortez and Pizzaro witnessed the Aztecs of Mexico and the Incas of Peru dyeing and making cloth. A garment dyed with Indigo was found in the ruins of Thebes which probably occurred at the time of the Flood, and a painting on an ancient vase shows that the weaving of Penelope, immortalized by Homer, differed but little from the hand-weaving of the Gobelin tapestries of today.

The Gobelin Museum in Paris contains some of the most ancient specimens of tapestry weaving in existence. These are attributed to the Coptics.

Many centuries ago the Persians and Babylonians made rugs by manipulating sticks and strings, and Appolonius upon relating his visit to Babylon in 1 B.C. recorded the finding of woven tapestries.

This brief narration will give a sufficient account to show the antiquity of fabric manufacture in our industry, and we will proceed to the main portion of this paper, namely, the processing of textiles. Processing textiles embodies the bleaching, dyeing and finishing process. Of these we will discuss the history of dyeing first since it is generally known to have been older than many of the other operations of textile processing.

Coloring

The appearance of color is older than the methods used in their production by man. As soon as light appeared on this earth color was given forth, and it could have been viewed had there been human eye there to see. Most naturally some colors would have been observed as beautiful, while others would not have been so pleasant. If Chinese history can be accepted as reflecting the facts, we will be prepared to date the use of dye baths or some means of coloring textiles as far back in time as 3000 B.C.

In the earliest records we discover that man used pig-

*Presented before the Piedmont Section.

ments to stain his body, to color skins, and to dye and stain numerous other objects.

Twenty-five hundred years before the Birth of Christ an Egyptian wrote on a piece of papyrus concerning a dyer: "His two eyes are oppressed with fatigue, his hand works incessantly."

Plutarch made a statement in his "Lives" which was written in the Second Century A.D.: "we draw pleasure from them but we regard the dyers—as vulgar and narrow minded fellows."

In studying dyeing in Egypt we note a very old document, dating from a period not much before the Christian Era, which states that the dyer became of many colors when carrying on his trade. This manuscript contains the following suggestion: "who would even think of being a dyer, to go around with hands and arms stained all sorts of colors and to be perpetually stinking." In early times the dyeing of cloths was a luxury, the great mass of people in the civilized world wore undyed clothing.

Dye-tanks of stone and earthenware were used by the Egyptians before Joseph was sold into bondage in Egypt.

Two manuscripts written in Egypt on papyrus were preserved in spite of a decree, of Emperor Diocletian, in 290 A.D. which commanded the destruction of manuscripts concerned with alchemy, which included the known chemical processes of that period. One of these is now in the possession of the University of Upsala in Sweden, and the other is at the University of Leyden in Holland. These manuscripts deal to a large extent with early dyeing processes.

Mummy cloths have been discovered to have been dyed with safflower and Iron Buff. Iron Buff is still in use now forty-five hundred years later. Some fabrics discovered in the tomb of Tutankhamen were dyed with indigo which was most probably imported from India. Pliny notes a process of mordant dyeing in Egypt, and Plutarch in his "Lives" tells about a large quantity of purple dyed material which retained its brilliance for one hundred and eighty years. In the tombs of Egypt evidences have been found that the inhabitants used madder, indigo and weld. In the remotest days they produced blacks by iron salts and "astringent principles," (tannates). Pliny, the elder, wrote, in his "Natural History," an account of mordant printing and dyeing. This work was written in the First Century. A short extract of it follows:

"There exists in Egypt, a wonderful method of dyeing, the whole cloth is stained in various places, not with dyestuffs but with substances which have the properties of absorbing colors. These applications are not visible on the cloth, but when the pieces are dipped in a hot caldron containing the dye, the remarkable circumstance is that though there is only one dye in the vat, yet different colors appear on the cloth. These colors cannot be removed thereafter."

While dyeing is a very ancient art in China, records are not available regarding its practice, however, the Emperor Huang-Ti is said to have issued the following decree: "Let colored and figured robes be prepared for the dignitaries of the court and let the designs be symbols of their various distinctions."

Present-day dyeing processes in China are very primitive and are scarcely more than the necessities actually require. It can be readily assumed therefore that about the same methods and, probably, the same substances have been used throughout the activities in this industry in China. We may conclude with considerable assurance of its probability that these processes are similar to those of the very dim past.

We know that in moderately ancient times dyeings were produced in China, and also that textile designs of high quality, especially in connection with silk were also made.

Blue has been the favorite Chinese color as far back into antiquity as we have any record. At present ninety-five per cent of all the Chinese are clad in blue fabrics, and the blue is largely obtained with indigo. It can be estimated that in a population of three hundred fifty to four hundred million there is an enormous amount of indigo consumed in the dyeing of textiles. The Chinese have dyed indigo for several millenniums, and at the present time their usual method for dyeing indigo depends upon the cold or lukewarm fermentation process. The same kind of vat is used for both cotton and silk.

In the Byzantine Empire and in Asia Minor we have records of dyeings showing very high artistic ability as well as skill in the dyer's art.

Byzantium, now Constantinople, was at one time the great center of a dyeing and textile industry. The largest trade in dyes for a considerable period was from this Empire, since from here came the plants, madder and woad, as well as the mollusc (shell fish) from which Tyrian Purple was obtained. From this Tyrian Purple the cities of Tyre and Sidon in Phoenicia became very wealthy over three thousand years ago.

The inhabitants of the valley of the Euphrates some five or six thousand years ago practiced the spinning, weaving and dyeing of fabrics.

The above mentioned Tyrian Purple is probably the most celebrated of all dyes mentioned in history. No one seems to know when or where it originated. Its history is so ancient that it is legendary. The best and most authentic records relate a legend concerning a nymph named Tyros who was wandering on the shores of the Mediterranean with her lover when her pet dog bit into a strange shell-fish and Tyros noticed a purple stain which remained on the dog's mouth. She persuaded her lover to catch more of these strange shell-fish and extract the marvelous coloring matter from them. With this he dyed a frock and thus discovered the famous dye, which for

many centuries thereafter was used to color the royal robes of priests, princes, and even kings.

Professor Pellew calculates the dyestuff value of Tyrian Purple on the assumption that an amount three per cent on the weight of the wool would produce a full shade and finds that the dry dyestuff would have a value in excess of seven thousand dollars a pound. The most authentic detailed information on this romantic story is given in a lecture by Professor Pellew at the Metropolitan Museum of Art in New York City on February 2, 1918.

As a result of the decline and fall of the Byzantine Empire, Venice became the great center of the textile and dyeing industry. From thence it spread throughout Central and Western Europe in the Thirteenth Century.

It was the Jews who first started the cultivation of indigo in Italy. This plant had previously been grown only in India. The Venetians later wrested the supremacy in the art of dyeing from the Jews.

Madder, another vegetable dyestuff, was known as "rubia tinctorium" to the Romans. In small quantities it was possible to produce red, purple and brown shades. The method of dyeing was known as "alizari," hence the name "alizarine" later given to the synthetic product discovered in the Nineteenth Century. In Italy the cities of Pompeii and Herculaneum were simultaneously destroyed by the eruption of Mount Vesuvius in 79 A.D. As a result of this catastrophe, many things were preserved to the world just as they were previous to the eruption.

The Greeks did not do much dyeing and it is stated that the Spartans expelled those who dyed wool from the Country, calling them "destroyers of the whiteness of wool."

The primitive ancestors of the Modern European and of a large portion of the present-day Amercians as well, the barbarians of the North of Europe had a love for color. Black was their favorite color and it was worn on all their festive occasions. Brown was the color of the common people. The Gauls of France and Belgium were great lovers of purple, while the ancient Britons preferred red.

The earliest records of dyers' formulas were written previous to 1410 and may be found in the Jehan le Begne manuscripts now in the French National Library.

Dyestuffs used by the ancients were woad, alkanna or henna and kermes grains for red, safflower for yellow, indigo for blue, oak leaves for grey or black and green nutshells for brown. Kermes is supposed to be one of the most ancient of dyes. It was similar to Cochineal but not as pure a shade and not as concentrated. The source of kermas was an insect.

A considerable revival of dyeing took place during the Renaissance when dyers' guilds were formed, the first of which seems to have been in Germany during the Twelfth Century. We also have records of important "Guilds" of dyers in Italian cities in the Thirteenth Century.

Printing was introduced into Europe by the Arabs when they conquered Spain in the Eighth Century. The printing was done by the means of blocks. Before its introduction the designs were hand painted on the fabrics.

Some of the chemicals used in these early dye establishments were copperas, alum, gall nuts, potash, fustic, indigo, cochineal, logwood, quercitron bark, cutch and Prussian blue.

Cochineal, logwood, fustic and quercitron bark were introduced during the Elizabethan period when the English explored the New World and returned with many new coloring matters.

The cultivation of madder was not introduced into England until the Seventeenth Century.

The first dyestuffs used in New England as well as in the other North America Colonies were used in the coloration of homespun. The dyeing of this material was generally a domestic operation being carried out in every home.

Shortly after the war of 1812, cochineal, logwood, cutch, fustic, indigo, madder and Prussian blue were being used as dyestuffs in the United States.

The barks of many species of oak were used as a basis for producing black, copperas or alum being used as mordants or "setting ingredients" using the term of that period.

All the indigo used in the colonies was imported until about 1742 when its cultivation was introduced into South Carolina from the West Indies by Miss Eliza Lucas. In 1775 the amount of indigo exported from South Carolina amounted to 1,107,660 pounds.

The cultivation of indigo in the South constituted one of the most important industries of the United States until the War of 1812 when it was largely supplanted by the cultivation of cotton.

Governor Winthrop was interested in the possibilities of growing indigo in New England, and in 1650 he wrote a memorandum on its manufacture.

The Colonial process of dyeing indigo was generally employed until after the War of 1812. It was as follows:

"Allow the finely pulverized dye to remain in contact with fermenting urine in a pot or tub to which lime or wood ashes was added to maintain a slightly alkaline reaction. Bran was frequently added to the fermenting mixture. The indigo pot was usually set in a warm place near the hearthstone and the frequent reference to the malodorous atmosphere was probably not exaggerated. After the indigo was reduced to the soluble leuco form, the fabric or yarn was worked in the liquor and then hung up in the air until the blue color was reformed

by oxidation. The dyed material was then washed and dried."

Bleaching

Bleaching by chemical means does not date much further back than comparatively recent times. The methods used in antiquity depended upon the action of sunlight and air on the color which was to be removed. Bleaching was almost entirely limited to vegetable fibers such as linen or cotton, since wool and silk were thought to be sufficiently white and only needed scouring.

Pliny describes the method of bleaching by the ancient Gauls. They made use of an alkaline substance known as "lixivium" extracted from the ashes of burnt wood which they employed with oils to form soaps. Burning sulfur fumes were employed at a much later date, and only in the latter part of the Eighteenth Century did chlorine compounds become known as bleaching agents.

The primitive method of bleaching required the exposure of the cloth on large grassy meadows for a long period of time. In the early part of the Eighteenth Century extensive bleaching fields were established in Ireland for the bleaching of linen.

Alkaline liquors were used for steeping and boiling the cloth the process taking several days. Then the linen was thoroughly washed and spread out on the grass for several weeks. These steeping and spreading out processes were repeated sometimes as often as six times. It was then steeped in sour milk, washed clean and again spread out on the grass.

Before bleaching became a National industry in Ireland, it was practiced chiefly in Holland, and up until the middle of the Eighteenth Century it could be almost stated that the Dutch held a monopoly of the bleaching trade in Europe, including the British Isles.

Scheele discovered chlorine in 1774, but not until 1785 were the bleaching properties of the gas studied in regard to its commercial application.

Berthollet was the first chemist who pointed out the commercial properties of chlorine as a bleaching agent on vegetable fibers, such as cotton and linen. The next step was the discovery by Tennant of Glasgow that chlorine saturated lime water gave a good bleaching solution. This process revolutionized the process of bleaching and decreased the time from several months to only a few days. Tennant somewhat later succeeded in making dry "chloride of lime", a name which it carries to this day. The product was prepared by saturating quicklime with gaseous chlorine.

Mercerizing

For many years it was known that the extent to which cotton materials absorbed dyestuffs is dependent largely on the treatment given the fiber upon subjecting it to caustic soda solution. When the caustic soda exceeds a certain concentration, marked physical and possibly some chemical changes take place in the fiber as shown by an untwisting, a swelling and a decrease in length. These changes in turn bring about a change in strength, luster and absorption of dyestuffs. The cotton is then said to be mercerized. John Mercer, the discoverer of this process, in 1844, advocated its use only as a means of strengthening the cotton and economizing in dyestuffs. Today its chief and in fact almost sole object is to obtain an enhanced luster. This property was discovered by Lowe, who in 1889 noticed that if the cotton were prevented from shrinking, it acquired a new luster, a soft silky feel and an increased power of responding to mechanical finishing processes such as calendering. This work of Lowe's laid a foundation for a commercially successful process, but it was not until 1895 that the method was extensively used.

Coal Tar Age

A large number of natural dyestuffs previously mentioned became obsolete when a New Age of Coal Tar or Synthetic Dyestuffs came into being.

The work of Wohler and his important discovery of the fact that vital or organic compounds could be made synthetically, laid the foundation on which the Coal Tar Dyestuff industry was afterward built. Wohler's name is associated with one of the most important discoverers in the realm of chemistry. In 1828 this German chemist succeeded in synthesizing urea, an organic compound, without the use of vital energy. Wohler was so astonished with this result that he did not have it published for three years, fearing that no one would believe it.

The next mark in our milestones is one which introduces us to the dyestuff industry. The first artificial dyestuff was made by accident. It was obtained by oxidizing indigo by means of nitric acid. This product was prepared by Woulfe, in 1771, who later discovered that the product was picric acid, which Guinon in Lyons used on silk in 1849. This dyestuff however was of little value because it was so fugitive to light. Due to this fact this discovery has not received its just recognition.

Shortly after this, the science of organic chemistry went forward very rapidly, being enthusiastically pushed forward by the faculty members of many European universities, and among the most brilliant was Adolph Von Hoffman, a German who was residing in England where he was engaged in teaching. It was he who first investigated the organic bases and showed that they might all be considered as derivatives of ammonia. His researches in this field are among the classics of chemistry. It was he who showed that aniline, discovered by Runge in 1834, might be regarded as a member of this class. It was due to this purely academic research that commercial artificial dyes were discovered.

One of Hoffman's students in a little laboratory in the

outskirts of London was a William Perkin who was working during his Easter vacation in 1856. Perkin was seventeen at this time. At dusk during a seemingly unsuccessful day's work, he picked up a flask half filled with a sticky mass of chemicals which he had obtained while he was trying to make quinine from aniline, an idea suggested by Hoffman. Since both of these substances were bases, the one differing from the other in containing oxygen, Perkin hoped to convert the aniline into the compound containing oxygen, quinine, by oxidation with potassium bichromate. His first impulse undoubtedly was to throw away the sticky mass of materials, but he paused and grasped a bottle of alcohol which he used to fill the flask. Immediately upon boiling the contents the solution was colored purple.

If Perkin could only have foreseen the tremendous consequences of his obtaining this color which he was viewing in the twilight during his Easter vacation! This color later proved to be the first commercially successful synthetic coal tar dyestuff, Mauve. One of the remarkable coincidents relating to this discovery, is, that if Perkin had used pure aniline instead of the impure aniline which contains toluidine, he would not have made this momentous discovery. There is also the good stroke of fortune that Perkin was persuaded, somehow, to have it dyed in silk. Experts in dyeing gave him such encouraging reports that he took out a patent for its manufacture on August 26, 1856. In 1857 with the assistance of his father and brother, a firm was started near Harrow, England for its production, thus manufacturing, commercially, the first synthetic coal tar dyestuff.

The next momentous discovery came seventeen years after that of Perkin's. This discovery was that of the diazo reaction. The pioneer in this field was Peter Griess, who was employed at Allsopps, the Burton brewers. Griess was a genius who accomplished more in his leisure hours than most men can in their working hours. In 1864 Griess discovered the action of nitrous acid on primary amines of the aromatic series, namely, diazotization, and showed that these diazotized compounds would couple with other amines. This discovery paved the way for the production of azo dyestuffs, which today form one of the largest groups of dyestuffs. These azo dyestuffs give us the majority of the two important classes, the direct cotton colors and the acid colors.

The first important member of this class of dyestuffs put on the market was Chrysodine discovered by Witt and Caro in 1876, although Bismark Brown had been previously made by treating meta phenylene diamine with nitrous acid. In fact Bismark Brown seems to have been known and prepared empirically before Griess' discovery of the method of diazotizing primary amines. In November of this same year the first Acid Dye, Orange II was made commercially by the firm of Poirrier in Saint Denis. The year of 1873 was of great importance to the dyer because of the discovery of Cachou de Laval, the first sulfide dye, now called Sulfur Dyes. This was the forerunner of a large number of dyes with the aid of which fast to washing shades can be readily produced on cotton. Cachou de Laval was prepared by Croissant and Bretonniere by the simple process of heating organic refuse with sulfur. Not until twenty years later was the first satisfactory sulfur color, Vidal Black, prepared. It should be pionted out that no other branch of dyestuff making requires such extensive experience because chemical research has not yet succeeded in obtaining a true insight into the sulfur fusion process.

About this time, 1869, another notable achievement was accomplished when madder was synthesized by Caro, Graebe and Liebeiman. This was the first synthesis of a natural dyestuff. The name alizarine was given to the synthetic product. This is the first carefully planned achievement of a dyestuff synthesis, and was one of the most brilliant found in modern chemistry. The endeavors of Graebe and Liebeiman to prepare alizarine from a sulfonic acid of anthraquinone were frustrated by their failure to sulfonate anthraquinone. They employed merely the same temperatures as were then customary for the production of sulfonic acids, and it was only later that H. Caro succeeded, by heating anthraquinone and sulfuric acid to over 200 degrees Centigrade, in obtaining a sulfonic acid that gave alizarine when fused with potash. Perkin independently made the same discovery, his English patent being filed only a few days later.

The next important contribution to the realm of coal tar dyestuffs was the synthesis of one of, if not the oldest, dyestuffs known, namely, indigo. This synthesis, that of the first vat dyestuff was completed by Adolph von Bayer of Munich in 1881. It took him nearly twenty years to discover how the atoms were united in this molecule, and it is due to these twenty years of research that we owe the fact that indigo costs so little today. In this case it was not so easy to go from the laboratory scale to the plant scale, and it was not until 1897 that synthetic indigo came on the market as a commercial commodity. The commercial production of this dyestuff was not successful until a condensing agent was discovered which could be used to convert phenylglycine into indoxyl, which passes directly to indigo on oxidation. Instead of caustic a product, sodium amide, commonly called "sodamide" was used successfully on a commercial scale.

Until the beginning of the present century indigo remained the only known vat color of commercial value. The first signal success in the field of analogues of indigo vat dyes was the production of thioindigo by Friedlander in 1906, while the first success in the anthraquinone field was the preparation of indanthrene and flavanthrene by Reni Bohn in 1901. There is one notworthy

difference between vat colors of the indigoid class and those derived from anthraquinone, namely, the vats formed by reducing indigoids are either colorless or only slightly colored, while the reduction products of the anthraquinone dyes are strongly colored substances substantive to cotton in an alkaline solution.

We believe we should not discuss the later developments such as the Naphthol AS dyes, Indigosols and Rapidogens because they are so closely related chemically to some of the milestones already mentioned. The story of their discovery is so recent that it is probably far better known by many of those in this audience than by the one who has attempted this feeble tribute to the great men of science who have given so much to our industry.

And now let us finish with the statement that all the milestones in the processing of textiles have not been passed and it is our fond hope that it may be possible for an American textile chemist or dyer to achieve some momentous success so that some future paper delivered before this Society may record another milestone, perhaps erected by some member of our own society.

NINETY-SIXTH COUNCIL MEETING

THE Council held its 96th meeting at the Engineers' Club of Boston, on Friday afternoon, June 15th. Present were William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; Hugh Christison, Carl Z. Draves, Donald H. Powers, and Walter M. Scott, Councilors at Large; Hans Meyer, representing New York; and Harold C. Chapin, Secretary.

Louis A. Olney was elected Chairman pro tem. The minutes of the last meeting were approved as published. The Treasurer's report of June 14, and the Secretary's balance sheet of June 13, both attached hereto, were accepted.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received before that date by the Secretary.

Active

William V. Baker, Daniel Baldecchi, Eugene Bernat, Clarence L. Cutler, Dwight L. Dimock, Ernest Hilker, Ernest C. Hilton, Lloyd O. Koons.

Junior

C. F. Gurnham, R. O. Schramm.

Associate

Donald C. Knapp, E. K. Rice.

Student

Robert T. Graham.

Patrick J. Kennedy, Bertil A. Ryberg, and George C. Ward were transferred to Active membership.

The action of the Secretary in placing membership applicants on mailing lists upon receipt of their dues was approved, with the understanding that the subsequent election of applicants be considered effective thirty days subsequent to publication of their applications.

The Convention dates, Friday and Saturday, December 7 and 8, in New York, were formally approved as dates for the Annual Meeting also.

The resignation of William C. Smith as Research Associate was accepted, to take effect June thirtieth.

Mr. Moorhouse reported for the Committee on Changes in the Constitution, recommending that the qualifications for Active membership be broadened to admit applicants having desirable professional qualifications but lacking the textile experience now required. It was suggested in the meeting that it might be well to confine to Active members, eligibility for election to major office in a senior section, and acceptability as sponsor to an Active membership application.

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary.*

Treasurer's Report, June 14, 1934

GENERAL FUND

Cash on hand—May 9, 1934 (Date of last Report)	$8,573.69
Receipts—May 9, 1934 to June 14, 1934	251.66
	$8,825.35
Expenditures—May 9, 1934 to June 14, 1934.	1,916.03
Balance—June 14, 1934	$6,909.32

RESEARCH FUND

Cash on hand—May 9, 1934 (Date of last Report)	$2,076.45
Receipts—May 9, 1934 to June 14, 1934 (Textile Foundation)	2,025.00
	$4,101.45
Expenditures—May 9, 1934 to June 14, 1934.	878.72
Balance—June 14, 1934	$3,222.73

BANK BALANCE

June 14, 1934

General Fund	$6,909.32
Research Fund	3,222.73
	$10,132.05
First National Bank—Checking Account	$4,595.62
First National Bank—Savings Account	5,536.43
	$10,132.05

(Continued on page (207) 385)

Proceedings of the American Association of Textile Chemists and Colorists

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary any vacancies which may occur in their businesses.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive

Note. Persons who have obtained employment should notify the secretary at once. Prospective employers may file vacancies either with the secretary or the American Dyestuff Reporter.

A-2

Education—B.T.C., Lowell Textile Institute, 1932; also course in typing.

Experience—None to date, interested in quantitative analysis, experimental dyeing, color matching, dye testing and dye identification. Ability to learn quickly and will go anywhere. 23 years old, woman, single.

A-5

Education—B.T.C., Lowell Textile Institute.

Experience—Assistant chemist in carpet mill, dye tester in dye plant, research and analytical work in silk dyeing and finishing plant laboratory, plant chemist and overseer of bleaching in surgical dressing plant, assistant chemist in woolen mill. Age 29. Married.

A-B-2

Education—Lowell Evening Textile School, 1917.

Experience—Five years' experience in hosiery dyeing, full fashioned hosiery of silk and cotton and silk, also men's hosiery containing rayon, wool, cotton and celanese. Several years experience in laboratory work. Has also had experience in jig-dyeing of cotton piece goods, slub and top dyeing.

A-B-C-1

Education—Graduate Industrial Chemical Engineer, Pratt Institute—1911.

Experience—One year as plant control chemist, 4 years as laboratory chemist with gas company, 13 years as plant chemist with bleaching, dyeing and finishing plant. (Rayon and cotton piece goods). Formulated processes and put them into plant operation, 1 year as chemist and demonstrator for dyestuff company, 1 year as superintendent colorist with print works printing linen and rayon, 1 year as director of testing laboratory for national dry goods concern.

A-E-2

Education—B.T.C., Lowell Textile Institute, 1933.

Experience—Assistant instructor in chemistry, Lowell Textile Institute. Member of scholastic honorary fraternity.

A-E-1

Education—Ph.D., Univ. of Illinois, studied chemical engineering at Columbia, licensed chemical engineer, New Jersey.

Experience—10 years' experience teaching in colleges, subjects included chemical and textile subjects. Has had broad experience in industrial work including experience in testing materials, research and consulting. Will go anywhere; references.

B-1

Education—Educated and trained in chemistry and calico printing in Glasgow, Scotland.

Experience—Has been with large print works as colorist for 13 years producing first class work on cotton, rayon, wool and silk fabrics. References.

B-2

Experience—Boss dyer with one firm for 18 years, divisional supt. at print works for 1 year, in charge of processing and dyeing of cottons and rayons at large bleachery for 6 years. Prefers bleachery in East but will go anywhere. References.

B-3

Experience—Foreman piece dyer for the past 21 years. Can dye the following; celanese, rayon, cotton slacks, wool, silk and mixed fabrics. Has knowledge of finishing and laboratory work.

B-6

Education—Graduate R. I. School of Design.

Experience—5 years in bleachery, 7½ years as assistant dyer, 2 years as boss dyer and 3 years as superintendent of dyeing and finishing. Married, 33 years old. References.

B-7

Experience—Eight years as boss dyer on skeins and ribbons. Over ten years as chemist and head dyer for a large hosiery mill. Experienced on Silk, cotton, rayon and wool in skeins, ribbons, piece goods and all kinds of mixtures. Willing to go anywhere. Not afraid to work or face responsibility. Can handle help efficiently.

B-8

Education—Chemistry and Dyeing Department, Philadelphia Textile School.

Experience—Eleven years experience as chemist and boss dyer on the following: woolen, worsted and cotton yarn; woolen, worsted and union piece dyes on both ladies' and men's wear; wool, cotton, shoddy and mohair raw stock. Age 33, married, will go anywhere. References.

B-9

Experience—Hosiery dyer with fifteen years' experience on high grade silk hosiery; familiar with all types of machines. Age 43, married. Will go anywhere.

B-11

Education—B.T.C., Lowell Textile Institute, 1926.

Experience—1 year dyeing raw stock with chrome colors, 6 years dyeing hosiery on all fiber combinations and cotton, wool and merino yarns in Franklin Process machines, several years experience in garment dyeing. Age 29. Married. References.

B-12

Education—2 years days at N. Y. U. and 3 years nights studying chemical engineering.

Experience—1½ years asst. colorist, 5½ years colorist. Experienced on vats, commercial and fast colors on cotton and cotton-rayon mixtures. References; age 29; married.

B-13

Experience—Large experience as an assistant colorist chemist in silk printing, dyeing and finishing; also on cotton and wool dyeing. References.

F-1

Education—Textile Institute, Alexander Hamilton Inst., Extension work at Brown Univ., working knowledge of German.

Experience—Has had executive departmental work with all types of textiles manufacturers. Acquainted with all types of textile machinery, dyestuff application, laboratory practice, cost methods, and checking methods and processes. References.

Ninety-sixth Council Meeting

(Continued from page (205) 383)

Cash on hand—November 1, 1933			$9,014.60
Total Receipts—November 1, 1933 to June 14, 1934			
General Fund			
From Secretaries	$6,730.01		
From Members	10.00	$6,740.01	
Research Fund			
From Secretaries	$1,707.00		
From Textile Foundation	$4,175.00	$5,882.00	12,622.01
			$21,636.61
Total Expenditures—November 1, 1933 to June 14, 1934			
General Fund		$5,227.31	
Research Fund		6,277.25	11,504.56
Cash on hand—June 14, 1934			$10,132.05

Respectfully submitted,
W. R. MOORHOUSE, *Treasurer.*

Secretary's Balance Sheet, June 13, 1934

	Applications	Dues, regular and reinstatement	Dues, sustaining and contributions	Dues, corporate	Miscellaneous	Totals
Received by both Secretaries, Nov. 1 to May 10	$532.50	$5,418.75	$275.00	$1,500.00	$282.69	$8,008.94
Received by Secretary, May 10 to June 13	70.50	95.00	0.00	0.00	6.50*	172.00
Receipts, total for fiscal year to June 13	603.00	5,513.75	275.00	1,500.00	289.19	8,180.94
Transmitted to Treasurer by both Secretaries	517.50	5,289.06	275.00	1,500.00	272.16	7,853.72
Leaving to order of Secretary in Appleton Bank of Lowell	85.50	224.69	0.00	0.00	17.03	327.22

*Analytical Methods and Postage.

STANDARD SILK SAMPLES

There have been prepared, under the direction of the Sub-Committee on Fastness of Dyed Silk, standard dyed silk fabrics to represent four classes of fastness to washing—namely, Class I, Class II, Class III and Class IV. These standards have been carefully dyed with the dyestuffs and according to the dyeing methods recommended in the 1931 Year Book.

The A. A. T. C. C. is prepared to furnish sets of these washing standards for a nominal charge which will cover the cost of preparation. It will be possible to accurately grade the fastness by comparing it with the standards after subjection to the standard washing tests approved by this Association. All inquiries concerning these Silk Washing Standards may be addressed to the Chairman of the Research Committee.

Louis A. Olney,
Lowell Textile Institute,
Lowell, Massachusetts.

ANALYTICAL METHODS
FOR A
TEXTILE LABORATORY

By Walter M. Scott

A book prepared from the series of articles, which appeared in the Reporter

75c per copy

Order from

H. C. Chapin
Lowell Textile Institute
Lowell Massachusetts

AMERICAN
DYESTUFF
REPORTER

LOUIS A. OLNEY, Sc.D.
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

NORMAN A. JOHNSON
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

A. P. HOWES
President

M. D. REESER
Secretary

H. F. CRAWFORD
Treasurer

Subscription price: $5.00 per year; Canadian $6.80; foreign $6.00

Vool. XXIII July 2, 1934 No. 14

FUTURE OF SILK CODE AUTHORITY

THE able Chairman of the Silk Textile Code Authority, Peter Van Horn, who is also Vice-President of the National Federation of Textiles, Inc., and director of this organization's policies and activities in serving the silk and rayon industry, is undoubtedly looking to the future and planning to build up a strong organization to serve the industry beyond the life of the NRA.

All who are interested in the future of this industry will agree with the theory that the problems of the industry will be much better handled through one strong organization than through a number of smaller organizations representing various groups in the industry. In this respect, Mr. Van Horn will have the well wishes and support of the trade in his efforts to consolidate the different trade groups into one strong and efficient organization.

It would be well, however, if the industry were to be told of the policies and plans which are behind the building up of this greater trade organization to represent the silk and rayon industry.

There are many questions in the minds of the members of this industry which undoubtedly could be answered by Mr. Van Horn at this time and which would give the trade more confidence that it is moving ahead in the right direction.

Now that price control is to be dropped from all codes which have not already put it into effect, how much further will the Silk Code Authority go in its plans to establish a cost accounting system to establish production costs and what will be the purpose of going further in this direction?

It is generally believed that the Code Authority has worked out a plan for controlling production by shutting down the mills when necessity arises. The details of this plan or policy would be most interesting to every member of the industry and would be helpful in the making of future plans for producing both silks and synthetics in the silk mills.

In connection with plans for curtailment, it is the feeling of many in the industry that no action of this kind should be taken which does not take into account the competitive situation in the cotton mills which are not affected by silk textile code shut-downs and which can run more on both silks and rayons if the opportunity is made for them.

There has been talk of a textile council to be appointed which would act as arbitrator to adjust the inequalities which are bound to arise between various branches of the whole textile industry working under the different codes. It seems to us that this suggestion offers a possible solution to many of the competitive problems existing because of the different rulings and regulations of the Cotton Code and the Silk Textile Code.

Among the proposed amendments to the Silk Textile Code which await the approval of the National Recovery Administration at Washington, is one which provides for the marking and identification as to fiber content of all merchandise produced by members of this industry operating under the Silk Textile Code. Beyond the fact that it has been presented by the Code Authority as an amendment to the Code, no further information has been given out as to the real purpose and seriousness of this amendment.

The amendment says, we believe, that the Code Authority "may" cause those firms operating under the Silk Code to mark and identify the fiber content of the merchandise they produce. We agree that the little word "may" was used wisely in preparing the amendment as it will not immediately force this industry to take action which would benefit competitors operating under the Cotton Code, the Authority for which has not yet, to our knowledge, taken any steps looking towards the marking or identification of the fiber content of their merchandise.

Even under the Code amendment as it is proposed, it is not clear as to whether rayons, as well as silks, must be identified by proper marking, if the amendment is approved and put into effect. A little more information on this point would be welcomed by the silk manufacturers of the industry, who are more than willing to mark their silk fabrics if rayon merchandise must also be marked.

• CIBA CIRCULARS

Ciba Co., Inc., representing the Society of Chemical Industry in Basle have issued the following sample cards, featuring new products of interest to dyers.

Circular No. 419. *Neolan Salt II;* a new dyeing assistant designed for use with the Neolan dyestuffs, whereby the amount of acid required for the dyeing is said to be very materially reduced and at the same time the shades are heavier and better penetrated and the time of boiling is considerably lessened. By the use of less acid, there is less action on the metal parts of dyeing apparatus and it is claimed that Neolan colors may be used to dye the wool in fabrics with cotton backs or effect threads, without danger of any tendering action.

Circular No. 420. *Cibacete Navy Blue GRN powd.* This new type differs from the older type Cibacete Navy Blue BN greenish, in that it has a much better tone in artificial light. It is said to level well and have good fastness to light, washing, water and perspiration. This type is of particular value in the dyeing of fabrics containing cotton and rayon in addition to the acetate fibers. This type is of no interest for printing or discharge.

Circular No. 422. *Ultravon W.* This is a new textile assistant used mostly in scouring, washing and kier boiling. It is of a soap-like nature in that it gives a heavy lather and is said to possess powerful emulsifying properties, but the solution is neutral and is not affected by acids or alkalies, nor is it precipitated by calcium, magnesium or aluminum salts. It is said to prevent the formation of mineral soaps in scouring baths and acts in general to give the dyer a pure clean fiber on which to work.

Sample Card No. 1150. *Neolan Navy Blue 2RL conc.* This type is particularly adapted for the production of serviceable Navy Blues on men's wear. It may be shaded with Neolan Pink BA for redder tones, or with Neolan Blue GG or Neolan Black 2G for bluer or darker tones. The fastness to wear, light, perspiration and water are claimed to be excellent and, even when dyed on carbonized stock, the softness and handle of the goods is said to be remarkably fine.

Sample Card No. 1157. *Cibanone Violet BW.* This compares in properties with the older type Cibanone Violet 2BW, but is of a clearer and somewhat redder tone. These violets are said to be especially noted for their fastness to water spotting, although they are also very good against hot pressing, alkalies, acids, acid boil, perspiration, chlorine and also the combined chlorine-peroxide bleach. Dyeings on silk are fast to boil-off.

Sample Card No. 1164. *Benzyl Red B.* A brilliant wool dye, furnishing deep reds to bordeaux tones said to be of good fastness to light, washing and water. Cotton, rayon and acetates are completely reserved. On account of its excellent solubility, combined with its other properties, Benzyl Red B is especially suited, according to the distributors, for application prints on wool or silk.

Sample Card No. 1172. *Direct, Chlorantine and Rigan Dyestuffs which reserve Acetates.* This card is illustrated with 63 dyeings on fabrics containing acetate effects and shows the most suitable dyestuffs for coloring the cotton or rayon, leaving the acetate fibers untinted.

• DYE TRADE

Calling attention to the fact that the domestic coal-tar dye industry now supplies the great bulk of all such dyes consumed in the United States, C. C. Concannon, Chief of the Commerce Department's Chemical Division, points out that a substantial export trade has also been developed.

Exports of coal-tar dyes from the United States during the first quarter of 1934 totalled 5,600,468 pounds valued at $1,605,858, compared with 4,897,570 pounds valued at $1,082,854 in the corresponding period of last year. China was the largest single market, taking 2,853,000 pounds valued at $700,563 during the first quarter of 1934 followed by British India with 574,656 pounds, Canada with 533,580 pounds, and Kwangtung with 392,842 pounds. Belgium, Netherlands, India, Mexico, Argentina, and Japan are other important purchasers of American dyes.

Coal-tar dyes imported into the United States during the first quarter of 1934 totalled 861,101 pounds, a decline of 86,811 pounds compared with the same period of last year. Because of higher invoice prices, however, the value rose from $939,095 to $1,238,058. This value increase was due in part, Concannon pointed out, to lower dollar exchange. Fifty-seven per cent of the imports during the first quarter originated in Germany and 41 per cent in Switzerland. While hundreds of varieties were imported most of them were in relatively small quantities.

The American coal-tar dye industry, the key industry to many manufacturing enterprises, has experienced remarkable growth during the past two decades. In 1914 total domestic production was only about 7,000,000 pounds; in 1932 it had risen to 71,269,000 pounds, while sales during that year reached $33,000,000.

• URGES COOPERATION

Speaking at a dinner given by the Jersey City Chamber of Commerce, recently—honoring Colgate-Palmolive-Peet Company which transferred headquarters back to that city—president S. Bayard Colgate urged merchants and business leaders not to become the "forgotten men".

"I believe that city, state, and federal government must, before long, realize that business cannot be called upon to pay higher wages, and at the same time shorten hours of work, while bearing greatly increased taxes and restrictive legislation.

"Business and government should cooperate toward prosperity", continued Mr. Colgate, "and if business men do not make themselves heard, no one is going to plead their case for them."

A Comparison of

Soap and Oil

for Degumming Silk

By NOEL D. WHITE

MUCH has been said, written and argued about what is the best medium to use in degumming hosiery as well as other silk fabrics, soap or degumming oils. After reading and listening to all arguments in favor of both and after having given a fair trial in a practical way to soap as well as to many degumming oils the writer has finally and conclusively decided that there is much to be said in favor of both mediums, also that there are very definite reasons why both have a place in the dyehouse and either can be used to advantage according to what kind of fabric and the nature of the fiber or fibers contained in it, and the condition prevailing in the dye-house.

Water plays a very important part in this. Most dyehouses today have some system for softening or filtering water, but there are places where the water is used raw from some stream, lake, spring or as furnished by the city and considered good enough to be used in the dyehouse. In this case the best medium for degumming is without question a degumming oil. Here the water cannot be relied upon to be the same all day and every day and it would be hazardous to use even the best of soaps. The danger of the soap breaking up and of impregnating the goods with pellets of a greasy, insoluble nature would always be present to disturb the peace and equanimity of the dyer. With a degumming oil that eventually would be removed and consistent good work easily obtained.

The water from streams changes in chemical property with every change in weather condition and seasons. The vegetation in the stream during the summer months, the melting of snows, the leaves and other matters rutting in the water during the winter are all causes that contribute to the natural changes that occur. After every rain a change in the water is sure to take place. To that must be added the drainage from mills that may be upstream and may contain from an iron pickling solution to chemicals of every kind that may float down and eventually be picked up and pumped into the water storing tank to be used in the dyehouse. City water on the other hand is most always filtered at the city's plant, but is liable to contain an undue amount of alum and the hardness therefrom vary sometimes to an alarming degree.

As a rule water containing above two degrees (2 pt. in 70,000) should be softened and filtered, if necessary, for use in degumming and when that is done soap can be used to advantage and economy, results are better and the finished product will look and feel considerably above those obtained by any other medium especially on the finest silk fabrics.

In degumming silk hosiery with soap it is always advisable to add to the bath some alkali to help saponify the emulients and lubricating agents used in throwing and knitting and also to prevent a too rapid exhaustion of the soap bath. One per cent of soda ash free from caustic, or double that amount of di-sodium phosphate can be used to advantage. Four per cent of silicate of soda would be a very good adjunct. With it in the bath the alkalinity is kept more constant and if there should be any iron rust from the water tank, the pipes or any other source in the water the silicate will effectually prevent it from contaminating the goods in processing.

Olive oil soap has been used for a long time as the only medium for boiling-off silk. It was considered the only thing and its many adherents still find they get the results they want for silk and silk fabrics processing with soap. However, conditions in the dyehouse may be such that soap can be displaced and a good degumming oil used instead to better advantage.

When silk hosiery containing rayon has to be degummed soap is not the best thing to use. Even if the water is of the best obtainable the foreign matters contained in the rayon fiber are a menace that makes the danger of grease and spots always present. In this case the oils with which the rayon is impregnated, besides the emulsions used in throwing and knitting, will contaminate the bath and cause it to break down easily. A good degumming oil is much to be preferred. The boiling-off can be done even with hard water without much trouble and if the right alkalinity is obtained in the bath either through the oil or by adding some alkali the dyer may secure good work on his goods. The selection of a good oil, however, is of the utmost importance.

There are many kinds of degumming oils from which to select. It would be idle to recommend one against others for the reason that most of them have been prepared for some specific purpose and have some favorable points assigned to them which they perform admirably when given a chance and properly used. Most of these oils are a combination of sulfonated oil or fatty compounds to which some sodium or potassium hydroxide has been

incorporated together with silicate of soda to act as a buffer for the protection of the silk fiber. Others have crysilic acid in them or a variety of solid compounds and charged with bicarbonate of soda. Their property of forming a stable fatty acid emulsion in the presence of hard water and acids should be the best recommendation for their use in degumming and dyeing silk hosiery containing rayon.

In selecting a soap or a degumming oil to boil-off silk the dyer must know what to look for and what to guard against. It is up to him to decide what is best for his line of work.

A good soap must do the degumming thoroughly in a short time, but should also wash out of the goods readily without breaking up. The soap with the slower rate of hydrolysis can be depended upon to penetrate the innermost parts in the closed nets in which hosiery is always degummed and to do a thorough job of it. A soap that hydrolyzes readily, in this case, will degum what is within free reach of it and when the soap has had a chance to reach the inside of the bags or to the tight knitted reinforcement it is too exhausted to do the work properly. Hence the results will be: hard places and uneven dyeings.

A soap for degumming should dissolve easily and remain in solution on cooling down. This kind of soap can be relied upon to wash out easily from the goods and this operation is a very important one especially when the hosiery is to be dyed by the two baths method. Danger from greasy goods and spots is eliminated when the goods are entered the dyeing bath in a thoroughly clean condition.

The choosing of a boil-off oil also requires a great deal of caution. Anyone of these has been devised for a purpose and what is claimed for it should be carefully investigated. It would be a folly to use a boil-off oil devised for processing rayon and cotton in degumming mixtures containing silk. Also there are oils, which should be more properly called liquid soaps of a low titer, that are supposed to be excellent for degumming, but when used with questionable water may give trouble to the user.

In all cases when degumming and dyeing are carried on in one and the same operation the use of a boil-off oil is to be preferred to soap. Here, too, the dyer would do well to use his judgment, deciding only after having made practical trials what is best for him to use. If he has several kind of fabrics and mixtures containing different fibers it would be much wiser to keep more than one kind of degumming medium rather than rely on one to do the work for all his goods.

There is another process by which degumming may be obtained with some degree of success. It is claimed that with this process degumming may be done at no higher than 142 degrees F. using in the bath a small percentage of caustic soda together with a buffer to protect the silk from the destructive action that the caustic has when used on silk. The writer has used caustic in the boil-off bath on piece goods containing wild silk (tussah). By exercising great caution no visible bad results had been noticed, but when this process was passed on to another dyer a lot of goods was irreparably damaged. Since it is the alkalinity in the soap that dissolves and causes the discharge of the sericin covering of the silk it seems natural that a strong alkali would strip it quicker and effectively but when this natural, protective covering on the silk is removed the silk is being attacked and easily destroyed by the same action that dissolves sericin. While it has been done successfully in the laboratory, in a practical way it is far from being safe and in the final analysis there is nothing to be gained by this process.

In concluding the writer hopes to have made it clear that the question resolves itself not in what is best to use, soap or oil, but when and how to use one or the other to the best advantage as both have a place in the modern dyehouse. The choice of a degumming medium is only determined by the material to be processed and the facilities obtaining in the dyehouse.

Bearing in mind that the most important operation in processing textiles in all forms is the preparation previous to dyeing, and as all goods containing silk are easily marred if the proper precautions are not observed it will be readily seen how obvious it is that, in order to avoid trouble as much as possible, whatever the medium for degumming chosen should be selected with care and should be the result of good judgment.

• ACQUIRES BURTON EXPLOSIVES

American Cyanamid & Chemical Corporation announces the acquisition, effective July 1st, 1934 of the plant, properties, and business of Burton Explosives, Inc., Cleveland, Ohio, which latter company has since its organization in 1930 been engaged in the manufacture and sale of high explosives and blasting supplies.

The explosives plant is located at New Castle, Pa. The plant is complete for the production of Commercial high explosives and is designed to prepare and manufacture a number of the raw materials used. The processes and methods installed result in an extremely economical operation.

The acquisition of this company brings to the American Cyanamid Organization a large production of high explosives and an established distributing organization covering twenty states with magazines conveniently located to serve the trade in that area. The high standards of quality and service of Burton Explosives will be maintained and expanded.

Mr. J. S. Burton, President of Burton Explosives, Inc., brings to American Cyanamid Organization a thorough knowledge of the explosive business together with a manufacturing and sales organization of experienced men of proven ability in their respective fields. Mr. Burton has been connected with the industry since 1895.

The business of Burton Explosives, Inc., will be carried on as the Burton Explosives Division of the American Cyanamid & Chemical Corporation, 30 Rockefeller Plaza, New York, N. Y.

OPEN FORUM

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Answers

7—I would like a preparation or mordant which, when applied to certain parts of woolen carpet yarn (in skeins), would resist dyeing in an acid dye bath.—**W. K. S.**

Answer No. 2—A wax resist is the only way of obtaining an acid dye resist for woolen carpet yarns. The following is a suitable mixing, definitely known to give satisfactory results:

60 parts Colophony.
5 parts Common Yellow Wax.
2 parts Mutton Suet.
3 parts Spermaceti.
2 parts Paraffin Wax.
4 parts Turpentine.

The above are heated together and the resulting paste is printed on the goods. Strew with Fuller's Earth to prevent sticking, and when dry, wet out the skeins in cold water and dye in a cold or lukewarm bath with the required acid color. In order to increase the affinity for the dye under these conditions, the skeins should previously be chlorinated.

In order to remove the resist, the skeins are washed with petroleum benzine and benzine soap. Obviously, only acid colors that are insoluble in benzine may be used, but most of them are.

The usual yarn printing appliances are of course essential.

The very same effect could of course be produced the reverse way about, by dyeing first in the acid color, and then discharging with a hydrosulfite mixing.—A. I. C.

11—In the dyeing and finishing of fabrics which have been treated with rubber latex, or in fabrics made from yarn which contain rubber filament, what precautions should be taken as to temperature in the dyebath and in drying?

Are there any chemicals ordinarily used in dyeing and finishing which should be avoided on account of their deteriorating effect upon the latex or rubber?

In what respects must such a process differ from the ordinary dyeing and finishing of similar material not containing any rubber?—**M. B. P.**

Answer—The handling of fabrics made with yarn known as Lastex in regard to dyeing temperatures, is the same as the handling of other fabrics. When cotton covered, they can be safely bleached and dyed under normal dyeing conditions. This is also applicable to silk covered, spun silk covered and Celanese covered yarns, whether handled in the skein or woven cloth. If dyeing in the skein, tub dyeing is the safest. They are then hydro-extracted and dried in any modern skein dryer, holding the drying temperature at not more than 140° F.

In dyeing the woven fabric, the jig method is most suitable using any of the good jig expanders which are on the market. Care should be exercised, however, in the preparation of these fabrics, viz., the first batching on the jig. No trouble should be encountered with creases when running goods that are properly batched and run with at least two ends unless the fabric shows the variation of width caused in the weaving. This can be greatly helped by proper manipulation, by the jigger, of the tension control. The least possible tension is most essential. As before mentioned, none of the ordinary methods of dyeing nor any dyestuffs or their combination, after treating, or chemicals in the course of regular dyeing are harmful, unless of course one goes to extremes such as stripping, redyeing, etc., which is not good for any fabric.

As to the finishing of these fabrics, the question is not definite as to what fabrics are meant. There are quite a few fabrics at present but the largest users seem to be the corset and brassiere manufacturers. The following is also advised in such fabrics as Lastex lining, etc. We are now only concerned with the handling of the woven fabric, not the knitted. Some of them are piece dyed, others yarn dyed. However, whether piece dyed or yarn dyed they must all be finished from the wet state.

The finishing of both these types is identical in handling. The piece dyed, after dyeing and rinsing are then batched and taken from the jig. They are more successfully handled by squeezing through mangle rolls direct to a set of can dryers,—a 12 to 16 can set is ideal. A good type of expander should be ahead of the dry cans. The first few cans should be cloth

covered then when the goods reach the bare hot cans the shock of the heat is not affecting the cloth; graduate the heat down on last four cans. The drying operation depends on the requirements of the user of the cloth, such as nominal width, how much stretch the Lastex must have, that is, percentage of stretch in a given number of inches, shrinkage of the cloth after finishing, shrinkage allowable by the buyer, or shrinkage demanded. This type of cloth will not stand any abuse and can not be successfully handled in the rope form. Tension is a big factor and slow rather than quick drying is necessary. A tenter can be used but care must be taken not to stretch the Lastex yarn beyond its natural stretch.

The yarn dyed fabrics are wet out on a jig. If rayon or Celanese warps—the warps must be desized. This procedure brings the fabric to the same condition as the piece dyed fabric. Any oils or finishes necessary can be applied in the jig, then the drying and finishing operations of both types are identical.

Use a light weight calender on these fabrics as a heavy calender may cut the Lastex yarn. The major points to be considered are tension in all operations, care in handling for creases and wrinkles and carefulness in use of set of cans and calenders. It will be noted that after drying, the uncovered cans will show a blue deposit; this is caused by the Lastex, and whether white, colors or blacks are run, this blue deposit will always be found on the dry cans. The Lastex manufacturer can more definitely tell what the deposit is. However, it is harmless to the finishing of these fabrics, only causing delay at times in washing the dry cans.—**E. C. E.**

13.—What are the best books in the field for general knowledge of dyeing? I am not interested especially in specific cases but rather in developing an intelligent background for observation of the subject.—**D. D.**

Answer—One of the best books covering the field of dyeing is "Application of Dyestuffs" by J. M. Matthews. It is none too technical for the average dyer to study and absorb. Another good book regarding the dyeing of cotton "The Dyeing of Cotton Fabrics" by Beech, Franklin and A. J. Hall is well worth reading. "Bleaching, Dyeing, Printing and Finishing" by J. W. McMyn and J. W. Bardsley covers the field exceptionally well. Follow these books by reading all current technical publications you are able to obtain—E. G.

Editorial Note—The above list might well be supplemented with the "Dyeing of Textile Fibers" by Horsfall and Lawrie, and "Dyeing with Coal Tar Dyestuffs" by Whittaker. These two books in combination with each other give a very excellent and up-to-date presentation of the dyeing of various textile fibers with the coal tar dyes. The American Dyestuff Reporter shall be glad to obtain any of these books upon request.

New Questions

15—I would like to know of an immunizing process for spun silk that will withstand chrome and afterchrome dyeing. The tannic acid and tin crystals methods do not stand up well enough. I would appreciate also the cost per pound of this treatment.—**S. C. H.**

16—Where the dyer has some cotton and some rayon knit goods fabric to process on wooden jigs, is it best to use certain tubs for cotton and certain tubs for rayon? Why?

What should be added to remove graphite knitting marks from cotton knit goods in a scour-bleach containing peroxide and soda ash?—**A. Z.**

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: General superintendent at present employed desires business connection. Have worked from bottom to top. Am practically and technically familiar with finishing plant operation. One position held eleven years. Seven years present location. Very best references. Details gladly furnished. Write Box No. 815, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Expert sulfonated oil Chemist THOROUGHLY familiar with manufacture of all types of textile oils. Give qualifications in detail. Replies confidential. Write *Southern Manufacturer*, Box No. 816, care of American Dyestuff Reporter, 440 Fourth Avenue, New York City.

POSITION WANTED by young man, graduate of recognized textile school. Department of Chemistry, Dyeing and Finishing; experienced in color shop and screen printing. Will go anywhere. Write Box No. 817, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Research and plant chemist, rayon processing man, with over ten years of practical experience with leading American and European dyeing and finishing organizations, presently on a business trip in Europe, will be available at the end of September. Write Box No. 818, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.